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ABSTRACT

This Rate Training Manual and Nonresident Career Course (RTM/NRCC) form a self-study package that will enable Hospital Corps personnel to help themselves fulfill the requirements of their rating. Among these requirements are the abilities to perform duties as assistants in the prevention, recognition, and treatment of disease and injuries, and in the administration of medical departments ashore, afloat, and in the field with the Marine Corps; perform first aid; assist in the transportation of the sick and injured; assist with physical examinations; give nursing care to patients, including the administration of medicines and parenteral solutions; collect laboratory specimens and perform simple laboratory procedures; instruct in personal hygiene, first aid, and self-aid; assist in the preparation and maintenance of medical records; assist in the maintenance of approved sanitary standards; and assist in the prevention and treatment of chemical, biological, and radiological casualties. Designed for individual study and not formal classroom instruction, the RTM provides subject matter that relates directly to the occupational qualifications of the Hospital Corpsman rating. The NRCC provides the usual way of satisfying the requirements for completing the RTM. The set of assignments in the NRCC includes learning objectives and supporting items designed to lead students through the RTM. The book covers the material needed by hospital corpsmen to pass the rating in 12 units. A list of commonly used abbreviations and a glossary are contained in the appendix. (KC)

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HOSPITAL CORPSMAN 3 & 2

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NAVAL EDUCATION AND TRAINING COMMAND
RATE TRAINING MANUAL AND NONRESIDENT CAREER COURSE

NAVEDTRA 10669-B

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Naval Education And Training Program Development Center

HOSPITAL CORPSMAN 3 & 2

NAVEDTRA 10669-B

DEPARTMENT OF THE NAVY ★ CHIEF OF NAVAL EDUC AND TNG

1981 Edition Prepared by
HMC Frederick R. Smith

PREFACE

This Rate Training Manual and Nonresident Career Course (RTM/NRCC) form a self-study package that will enable ambitious Hospital Corps personnel to help themselves fulfill the requirements of their rating. Among these requirements are the abilities to perform duties as assistants in the prevention, recognition, and treatment of disease and injuries, and in the administration of medical departments ashore, afloat, and in the field with the Marine Corps; perform first aid; assist in the transportation of the sick and injured; assist with physical examinations; give nursing care to patients, including the administration of medicines and parenteral solutions; collect laboratory specimens and perform simple laboratory procedures; instruct in personal hygiene, first aid, and self-aid; assist in the preparation and maintenance of medical records; assist in the maintenance of approved sanitary standards; and assist in the prevention and treatment of chemical biological, and radiological casualties.

Designed for individual study and not formal classroom instruction, the RTM provides subject matter that relates directly to the occupational qualifications of the Hospital Corpsman rating. The NRCC provides the usual way of satisfying the requirements for completing the RTM. The set of assignments in the NRCC includes learning objectives and supporting items designed to lead students through the RTM.

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THE UNITED STATES NAVY

GUARDIAN OF OUR COUNTRY

The United States Navy is responsible for maintaining control of the sea and is a ready force on watch at home and overseas, capable of strong action to preserve the peace or of instant offensive action to win in war.

It is upon the maintenance of this control that our country's glorious future depends; the United States Navy exists to make it so.

WE SERVE WITH HONOR

Tradition, valor, and victory are the Navy's heritage from the past. To these may be added dedication, discipline, and vigilance as the watchwords of the present and the future.

At home or on distant stations we serve with pride, confident in the respect of our country, our shipmates, and our families.

Our responsibilities sober us; our adversities strengthen us.

Service to God and Country is our special privilege. We serve with honor.

THE FUTURE OF THE NAVY

The Navy will always employ new weapons, new techniques, and greater power to protect and defend the United States on the sea, under the sea, and in the air.

Now and in the future, control of the sea gives the United States her greatest advantage for the maintenance of peace and for victory in war.

Mobility, surprise, dispersal, and offensive power are the keynotes of the new Navy. The roots of the Navy lie in a strong belief in the future, in continued dedication to our tasks, and in reflection on our heritage from the past.

Never have our opportunities and our responsibilities been greater.

CONTENTS

CHAPTER Page

1. The Hospital Corpsman 1-1
2. Orientation 2-1
3. Anatomy and Physiology 3-1
4. First Aid and Emergency Procedures 4-1
5. Patient Care 5-1
6. Clinical Laboratory 6-1
7. Pharmacology and Toxicology 7-1
8. Pharmacy 8-1
9. Health Records and Physical Examinations 9-1
10. Administration 10-1
11. Preventive Medicine 11-1
12. Chemical, Biological, and Radiological Warfare 12-1

APPENDIX

1. Commonly Used Abbreviations A1-1
2. Glossary A2-1

INDEX I-1

Nonresident Career Course follows Index

Parts of this Rate Training Manual are based on the *Manual of the Medical Department* (MANMED). Change 95, a major revision of much of the MANMED, was distributed too late for the changes to be reflected in this publication. If there are conflicts between the publications, use the MANMED as the most recent source.

CHAPTER 1

THE HOSPITAL CORPSMAN

This training course has been prepared for men and women of the Navy and of the Naval Reserve who are studying for advancement to the rates of Hospital Corpsman Third Class (HM3) and Hospital Corpsman Second Class (HM2).

The Hospital Corpsman qualifications used as a guide in the preparation of this training course are those contained in Section I, Navy Enlisted Occupational Standards, of the *Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards* (NAVPERS 18068 Series).

This training course is designed to help you meet the professional (technical) qualifications for advancement to HM3 and subsequently to HM2.

Chapters three through twelve of this training course deal with required technical subject matter. This chapter provides information that will help you in working towards advancement. We strongly recommend that you study this chapter carefully before going on to the remainder of the course.

Your intentions are clear by the fact that you have this training course in your hands; obviously you are seeking advancement. Up to the present time you have been undergoing an indoctrination period in the Hospital Corps, learning the fundamentals of your rating. These fundamentals will always be a prime requisite for any advancement you may seek in the Hospital Corps.

At present you are an individual who has learned about ward duty, night duty, special watches and details and, in some instances, special departments. Generally speaking, you have spent most of your time at a Naval Regional Medical Center or other large shore installation, or if aboard ship, it has been on one that has a large medical department. You may also have been assigned to duty with the Fleet Marine Force. Most of the time you have been under the immediate supervision of a senior corpsman or the ward nurse, who was responsible for your actions. You were the follower.

The advancement that you are now seeking will put you in a dual position: not only will you still be the follower and be responsible to your superiors, but by virtue of your rate, you will become a leader of those below you and in turn be responsible for their effective performance.

DUTIES

As a petty officer, your duty assignments will be enlarged and your scope of function will increase. More will be expected of you from your superiors, and your need for additional knowledge and skills will increase, not only within the realm of your job but also from a military standpoint. Additionally, you will be required to supervise and instruct those under you and be responsible for their work. Constant study, attention to detail, and alertness are required to keep you abreast of your duties.

RESPONSIBILITY

As a petty officer, your responsibilities will increase, both professionally and militarily. Your advancement may make you senior corpsman of your ward or possibly put you in charge of a special department, such as the treatment room, clinic, record office, or sick call. Militarily you may become a section leader, responsible for a number of people, their muster and other administrative details such as liberty, duty rosters, emergency drills, and battle stations. Again, attention to detail and faithful study will enhance your future as a petty officer.

PATIENT RELATIONSHIP

Since patients are our most important concern, you, as a Hospital Corps petty officer, can do much to engender better patient morale within your organization. As a petty officer it is your responsibility to make sure those under you practice good professional ethics at all times.

PROFESSIONAL ETHICS

Professional ethics refers to the adherence to moral principles by members of a profession in the practice of that profession. As a hospital corpsman, you must learn and adhere to a code of behavior that is based on sound moral beliefs and is so ingrained that it becomes a way of life. Your responsibility as a hospital corpsman is to exhibit ethical behavior in three major areas.

YOUR FIRST RESPONSIBILITY IS TO YOUR PATIENT

You must always recognize your obligation to give the best care that you are capable of giving to every patient committed to your charge. This care must reflect a belief in the worth and dignity of every patient as a human being. Courteous, efficient, and conscientious service is the mark of an outstanding corpsman. Respect for the patient's right to privacy must always be honored, particularly when he discloses privileged information to you. Such information should never be repeated to any unauthorized person. Your patient's welfare is of paramount importance.

YOUR SECOND RESPONSIBILITY IS TO THE TEAM

Doctors, nurses, and hospital corpsmen comprise the team dedicated to healing the patient. Mutual respect and understanding of the role and the person by each member is of vital importance to the success of the team. Cooperation of all the members is essential. The doctor, as team leader, carries the overall responsibility for the welfare of the patient. He prescribes the medical treatment and oversees the total care of all patients. The nurse is responsible for meeting the nursing needs of the patient and ensuring that all of the doctor's orders and nursing measures are carried out accurately. Both the doctor and nurse are responsible for instructing hospital corpsmen in the performance of their duties.

The hospital corpsman is responsible for carrying out the doctor's and nurse's orders and giving proper nursing care to patients.

YOUR THIRD RESPONSIBILITY IS TO THE HOSPITAL CORPS

The heritage of the Hospital Corps places a special burden on every new member. You are responsible for upholding its proud tradition. The tradition of "service with distinction" has been established by your predecessors in every corner of the world and under every kind of adversity. Your patient, the members of the team you serve, and your shipmates deserve your respect and cooperation. They merit your confidence. Respect and confidence coupled with your skill will allow you to carry on in the proud tradition of the Hospital Corps. Professional ethics is the key to service with distinction.

DESIRABLE SKILLS

The minimum skills, both professional and military, required for advancement to HM3 and HM2 are spelled out in the *Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards* (NAVPERS 18068 series). However, there are some skills which, although not officially required, are and will be desirable in an outstanding petty officer. Acquiring these skills is entirely up to you;

however, having them will be decidedly to your advantage. Some of these desired skills are:

1. Clerical ability. Learn to read and complete medical forms, such as health records and medical reports, clearly and accurately.
2. Ability to operate office machines, such as adding machines, calculators, and, if available, various copying and duplicating machines. At one time or another you will be called upon to use these machines.
3. Ability to read and understand the various naval directives and regulations. Develop a working acquaintance with the Navy Directives System.
4. Penmanship. Begin now to develop a neat, legible handwriting.
5. Communication. Learn to express your thoughts in writing and practice good grammar. Listening is an important part of the process, especially in the health care area.

PERSONAL TRAITS

A Hospital Corps petty officer must develop many personal traits that apply to all petty officers. You can get a general understanding of them by referring to *Military Requirements for Petty Officers 3 & 2* (NAVEDTRA 10056 series).

The following traits, however, apply especially to your Hospital Corps duties and are essential for good performance.

FINANCIAL RESPONSIBILITY

As a petty officer you will be held responsible for your personal debts and financial dealings. Always obey the following cardinal rules:

1. Never have any financial dealings with patients or those under you. Violating this cardinal rule will always lead to trouble and embarrassment for you and your command.
2. Always pay your bills on time. Letters of indebtedness have ruined many a service career, often many years after the debts were incurred.
3. Live within your means, and, except under extreme emergencies, do not borrow money that you can't pay back without upsetting your budget.

PERSONAL APPEARANCE

Good personal habits, cleanliness, neat haircuts, and spotless, correct uniforms are absolute musts in the Hospital Corps. Ours is a profession in which we meet the public constantly, and the medical public always seems to be more critical of appearances. The personal appearance and attitude of the staff does much to enhance the overall reputation of the medical department and reinforces our role as health care teachers.

INTEGRITY

Nowhere in the Navy is the need for personal integrity so great as in the Hospital Corps where we are continually dealing with people, their troubles, illnesses, and personal problems. This knowledge falls into the category of "privileged communication." We as Hospital Corps personnel have no right whatsoever to divulge any medical information, however trivial, to any unauthorized individuals. Medical information is prime gossip material. This is sometimes difficult to remember but should remain an absolute must for professional integrity.

Integrity also encompasses adherence to commitments, commonly referred to as keeping one's promise. Whatever the commitment, whatever the price, your word is your bond—until broken.

One important commitment that all corps personnel have is the obligation to never abuse or to tolerate the abuse by others of the controlled medical substances that we have access to. These medications are on the ward or in the mount-out block for use, under a medical officer's supervision, in the care and rehabilitation of patients. Any other use must not be tolerated.

LEADERSHIP

Naval leadership is based on personal example, good management, and moral responsibility. All of the personal traits previously discussed are also leadership traits. Success of the Medical Department rests heavily on the petty officer. Good petty officers are the backbone of the Navy whether they are supervising military or specialist duties. Many examples of effective leadership you learn may be by the examples set by officers and senior petty officers. The best way to learn effective leadership is by practicing it. A general discussion on leadership is included in *Military Requirements for Petty Officers 3 & 2* (NAVEDTRA 10056 series).

ADVANCEMENT IN RATING

The enlisted rating structure is the primary administrative tool that provides for the general classifying, identifying, and reporting of personnel requirements for Navy enlisted personnel. It is the framework for career development of enlisted personnel. The present rating structure, established in 1957, is based on the following concepts:

a. A single, integrated structure applicable to both the Regular Navy and Naval Reserve, which will serve both peacetime and wartime needs. This will eliminate the need for elaborate expansion and conversion in the event of mobilization.

b. Specialization at lower petty officer levels to adjust to an expanding technology, reduce training time, and improve utilization of first-term personnel.

c. Senior petty officers with broad military and technical qualifications.

The enlisted rating structure consists of paths of advancement from recruit general apprenticeships through MCPO. For purposes of ready identification, the structure is divided into GENERAL RATINGS and SERVICE RATINGS.

GENERAL RATINGS identify broad occupational fields of related duties and functions. Some general ratings include service ratings; others do not. These ratings identify personnel from PO3 through MCPO and are applicable to both the Regular Navy and Naval Reserve (e.g., HM, BM, YN).

SERVICE RATINGS identify subdivisions or specialties within a general rating. Although service ratings can exist at any petty officer level, they are most common at the HM3 and HM2 levels. They are applicable to personnel of both the Regular Navy and Naval Reserve (e.g., DTG, DTP, CTM).

THE NAVY ENLISTED ADVANCEMENT SYSTEM

Many of the rewards of Navy life are earned through the advancement system. The basic ideas behind the system have remained stable for many years, but specific portions may change rather rapidly. It is important that you know the system and follow the changes carefully.

The normal system of advancement may be easier to understand if it is broken into two parts:

1. Those requirements that must be met before you may be considered for advancement.
2. Those factors that actually determine whether or not you will be advanced.

QUALIFYING FOR ADVANCEMENT

In general, to QUALIFY (be considered) for advancement, you must first:

1. Have a certain amount of time in pay grade.
2. Demonstrate knowledge of material in your mandatory Rate Training Manuals by achieving a suitable score on your command's test, by successfully completing the appropriate NRCCs, or, in some cases, by successfully completing an appropriate Navy school.
3. Demonstrate the ability to perform all the practical requirements for advancement by completing the Personnel Advancement Requirements (PAR), NAVEDTRA 1414/4 (HM).
4. Be recommended by your commanding officer.
5. For PO3 and PO2 candidates ONLY, demonstrate knowledge of military subjects by passing a locally administered MILITARY/LEADERSHIP examination based on the naval standards for advancement (from NAVPERS 18068 series).
6. Demonstrate knowledge of the technical aspects of your rate by passing a Navywide advancement examination based on the occupational standards applicable to your rate (from NAVPERS 18068 series, those standards listed at and below your rate level).

Figure 1-1 gives a detailed view of the requirements for advancement of active duty personnel; figure 1-2 gives this information for inactive duty personnel. Remember that the occupational standards can change. Check with your division officer or training officer to be sure that you know the most recent standards.

If you meet all of the above requirements satisfactorily, you become a member of the group from which advancements will be made.

WHO WILL BE ADVANCED?

Advancement is not automatic. Meeting all of the requirements makes you eligible but does not guarantee your advancement. Some of the factors that determine which persons, out of all of those QUALIFIED, will actually be advanced in rate are the score made on the advancement examination, the length of time in service, the performance marks earned, and the number of vacancies being filled in a given rate.

If the number of vacancies in a given rate exceeds the number of qualified personnel, then ALL of those qualified will be advanced. More often, the number of qualified people exceeds the vacancies. When this happens, the Navy has devised a procedure for advancing those who are BEST qualified. This procedure is based on combining three personnel evaluation systems:

Merit rating system (Annual evaluation and COs recommendation)

Personnel testing system (Advancement examination score—with some credit for passing previous advancement exams)

Longevity (seniority) system (Time in Rate)

Simply, credit is given for how much the individual has achieved in the three areas of performance, knowledge, and sensitivity. A composite, known as the final multiple score, is generated from these three factors. All of the candidates who have PASSED the examination from a given advancement population are then placed on one list. Based on the final multiple score, the person with the highest multiple score is ranked first, and so on, down to the person with the lowest multiple score. For candidates for E-4, E-5, E-6, advancement authorizations are then issued, beginning at the top of the list, for the number of persons needed to fill the existing vacancies. Candidates for E-7 whose final multiple scores are high enough will be designated PASS SELBD ELIG (Passed Selection Board Eligible). This means that their names will be placed before the Chief Petty Officer Selection Board, an NMPC board charged with considering all so-designated eligible candidates for advancement to CPO. Advancement authorizations for those being advanced to CPO are issued by this board.

Who, then, are the individuals who are advanced? Basically, they are the ones who achieved the most in preparing the advancement. They were not content to just qualify; they went the extra mile in their training, and through that training and their work experience they developed greater skills, learned more, and accepted more responsibility.

While it cannot guarantee that any one person will be advanced, the advancement system does guarantee that all persons within a particular rate will compete equally for the vacancies that exist.

HOW TO PREPARE FOR ADVANCEMENT

To prepare for advancement, you will need to study and be familiar with (1) the *Occupational Standards Manual,* (2) The Personnel Advancement Requirements, (3) a publication called *Bibliography for Advancement Study* NAVEDTRA 10052, and (4) applicable rate training manuals. The following sections describe them and give you some practical suggestions on how to use them in preparing for advancement.

Occupational Standards Manual

The *Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards,* NAVPERS 18068-series, contains the rating occupational and naval standards for advancement to each pay grade in section I. The Navy Enlisted Classification codes are contained in section II. This manual replaces the "quals manual" and the NEC manual.

REQUIREMENTS*	E1 to E2	E2 to E3	E3 to E4	E4 to E5	E5 to E6	†E6 to E7	†E7 to E8	†E8 to E9
TIME IN GRADE	6 mos.	6 mos.	9 mos.	12 mos.	36 mos.	36 mos.	36 mos.	36 mos.
SCHOOL	Recruit Training. (C.O. may advance up to 10% of graduating class.)		Class A for PR3, DT3, IS3, AME3, HM3, FTB3, MT3, MU3, EW3, CT3	Naval Justice School LN2		Navy School for AGC, MUC	Assistant Bandleader Course MUCS	Assistant Bandleader Course MUCM
PERSONNEL ADVANCEMENT REQUIREMENT (PAR) NAVPERS 1414/4			Personnel Advancement Requirement (PAR) must be completed for advancement to E-4 through E-7.					
PERFORMANCE TEST			Specified ratings must complete applicable performance tests before taking examinations.					
ENLISTED PERFORMANCE EVALUATION	As used by CO when approving advancement.		Counts toward performance factor credit in advancement multiple.					
EXAMINATIONS**	Locally prepared tests.	See below.	Navywide examinations required for all PO advancements. Military leadership exam required for E-4 and E-5.				Selection Board	
RATE TRAINING MANUAL (INCLUDING MILITARY REQUIREMENTS)		Required for E-3 and all PO advancements unless waived because of school completion, but need not be repeated if identical course has already been completed. See NAVEDTRA 10052 (current edition).					Nonresident career courses and recommended reading. See NAVEDTRA 10052 (current edition).	
AUTHORIZATION	Commanding Officer		NAVEDTRAPRODEVCEN					

*All advancements require commanding officer's recommendation.
†2 years obligated service required for E-7, E-8, and E-9.
**For E-2 to E-3, NAVEDTRAPRODEVCEN exams or locally prepared tests may be used.

Figure 1-1.—Active duty advancement requirements.

REQUIREMENTS*	E1 to E2	E2 to E3	E3 to E4	E4 to E5	E5 to E6	E6 to E7	E7 to E8	E8 to E9
TOTAL TIME IN GRADE	6 mos.	6 mos.	9 mos.	12 mos.	36 mos.	36 mos.	36 mos.	36 mos.
TOTAL TRAINING DUTY IN GRADE†	14 days	14 days	14 days	14 days	28 days	42 days	42 days	28 days
PERFORMANCE TESTS			Specified ratings must complete applicable performance tests before taking examination.					
DRILL PARTICIPATION	Satisfactory participation as a member of a drill unit in accordance with BUPERSINST 5400.42 series.							
PERSONNEL ADVANCEMENT REQUIREMENT (PAR) NAVPERS 1414/4			Personnel Advancement Requirements (PAR) NAVPERS 1414/4 must be completed for advancement to E4 through E7.					
RATE TRAINING MANUAL (INCLUDING MILITARY REQUIREMENTS)	Completion of applicable course or courses must be entered in service record.							
EXAMINATIONS**	Locally prepared tests.	See below.	Navywide examinations required for all PO advancements. Military leadership exam required for E-4 and E-5.				Selection Board	
AUTHORIZATION	Commanding Officer		NAVEDTRAPRODEVCEN					

*Recommendation by commanding officer required for all advancements.
†Active duty periods may be substituted for training duty.
**For E-2 to E-3, NAVEDTRAPRODEVCEN exams or locally prepared tests may be used.

Figure 1-2.—Inactive duty advancement requirements.

NAVAL STANDARDS are requirements that apply to all ratings rather than to any one particular rating. Naval requirements for advancement to third class and second class petty officer rates deal with military conduct, naval organization, military justice, security watch standings, and other subjects that are required of petty officers in all ratings.

You are required to pass a Navywide military/leadership examination for E-4 or E-5, as appropriate, before you take the occupational examinations. The military/leadership examinations are administered on a schedule determined by your commanding officer. Candidates are required to pass the applicable military/leadership examination only once. Each of these examinations consists of 100 questions based on information contained in *Military Requirements for Petty Officer 3 & 2,* NAVEDTRA 10056 (current edition) and in other publications listed in *Bibliography for Advancement Study,* NAVEDTRA 10052 (current edition).

The Navywide occupational examination for pay grade E-4 and E-5 will contain 150 questions related to occupational areas of your rating.

If you are working for advancement to second class, remember that you may be examined on third class standards as well as on second class standards.

Both the naval standards and the occupational standards are divided into subject matter groups.

NAVPERS 18068 series is kept current by means of changes. The occupational standards for your rating that are covered in this training manual were current at the time the manual was printed. By the time you are studying this manual, however, the standards for your rating may have been changed. Never trust any set of standards until you have checked it against an UP-TO-DATE copy in the NAVPERS 18068 series.

Personnel Advancement Requirements

Before you can take the Navywide examination for advancement, there must be an entry in your service record to show that you have qualified in the naval and occupational standards for that rate. The Personnel Advancement Requirements (PAR) mentioned earlier are used to keep a record of your advancement requirements. As you demonstrate your ability to perform each requirement, appropriate entries are made in the DATE and INITIALS columns.

Changes are made periodically to the *Occupational Standards Manual,* and revised forms of NAVPERS 1414/4 (HM) are provided when necessary. Extra space is allowed on the Personnel Advancement Requirement for entering additional requirements as they are published in changes to the *Occupational Standards Manual.* The Personnel Advancement Requirement also provides space for recording demonstrated proficiency in skills that are within the general scope of the rating but that are not identified as minimum occupational standards.

Until completed, the NAVPERS 1414/4 (HM) is usually held by your division officer; after completion, it is forwarded to the personnel officer for insertion in your service record. If you are transferred before qualifying in all requirements, the incomplete form should be forwarded with your service record to your next duty station. You can save yourself a lot of trouble by making sure that this form is actually inserted in your service record before you are transferred. If the form is not in your service record, you may be required to start all over again and requalify in the requirements that have already been checked off.

Bibliography for Advancement Study

The *Bibliography for Advancement Study,* NAVEDTRA 10052, is a very important publication for any enlisted person preparing for advancement. This bibliography lists required and recommended rate training manuals and other reference material to be used by personnel working for advancement.

NAVEDTRA 10052 is revised and issued once each year by the Chief of Naval Education and Training. Each revised edition is identified by a letter following the NAVEDTRA number. When using this publication, be SURE that you have the most recent edition.

If extensive changes in standards occur in any rating between the annual revisions of NAVEDTRA 10052, a supplementary list of study material may be issued in the form of an

NMPC Notice. When you are preparing for advancement, check to see whether changes have been made in the standards for your rating. If changes have been made, see if an NMPC Notice has been issued to supplement NAVEDTRA 10052 for your rating.

The required and recommended references are listed by pay grade in NAVEDTRA 10052. If you are working for advancement to third class, study the material that is listed for third class. If you are working for advancement to second class, study the material that is listed for second class; but remember that you are also responsible for the references listed in the third class level.

In using NAVEDTRA 10052, you will notice that some rate training manuals are marked with an asterisk (*). Any manual marked in this way is MANDATORY—that is, it must be completed at the indicated rate level before you can be eligible to take the navywide examination for advancement. Each mandatory manual may be completed by (1) passing the appropriate nonresident career course that is based on the mandatory training manual; (2) passing locally prepared tests based on the information given in the training manual; or (3) in some cases, successfully completing an appropriate naval school.

Do not overlook the section of NAVEDTRA 10052 that lists the required and recommended references relating to the naval standards for advancement. Personnel of ALL ratings must complete the mandatory military requirements training manual for the appropriate rate level before they can be eligible to advance.

The references in NAVEDTRA 10052 that are recommended but not mandatory should also be studied carefully. ALL references listed in NAVEDTRA 10052 may be used as source material for the written examinations, at the appropriate rate levels.

Rate Training Manuals

There are two general types of rate training manuals. RATING manuals (such as this one) are prepared for most enlisted ratings. A rating manual gives information that is directly related to the occupational standards of ONE rating. SUBJECT MATTER manuals or BASIC manuals give information that applies to more than one rating.

Rate training manuals are revised from time to time to keep them up to date technically. The revision of a rate training manual is identified by a letter following the NAVEDTRA number. You can tell whether any particular copy of a training manual is the latest edition by checking the NAVEDTRA number and the letter following this number in the most recent edition of *List of Training Manuals and Correspondence Courses,* NAVEDTRA 10061. (NAVEDTRA 10061 is actually a catalog that lists all current training manuals and courses; you will find this catalog useful in planning your study program.)

Each time a rate training manual is revised, it is brought into conformance with the official publications and directives on which it is based; but during the life of any edition, discrepancies betwen the manual and the official sources are almost certain to arise because of changes to the latter that are issued in the interim. In the performance of your duties, you should always refer to the appropriate official publication or directive. If the official source is listed in NAVEDTRA 10052, the Naval Education and Training Program Development Center uses it as a source of questions in preparing the fleetwide examinations for advancement. In case of discrepancy between any publications listed in NAVEDTRA 10052 for a given rate, the examination writers will use the most recent material.

Rate training manuals are designed to help you prepare for advancement. The following suggestions may help you to make the best use of this manual and other Navy training publications when you are preparing for advancement.

1. Study the naval standards and the occupational standards for your rating before you study the training manual and refer to the standards frequently as your study. Remember, you are studying the manual primarily in order to meet these standards.

2. Set up a regular study plan. It will probably be easier for you to stick to a schedule if you can plan to study at the same time each day. If possible, schedule your studying for a time of day when you will not have too many interruptions or distractions.

3. Before you begin to study any part of the manual intensively, become familiar with the entire book. Read the preface and the table of contents. Check through the index. Thumb through the book without any particular plan, looking at the illustrations and reading bits here and there as you see things that interest you.

4. Look at the training manual in more detail to see how it is organized. Look at the table of contents again, then, chapter by chapter, read the introduction, the headings, and the subheadings. This will give you a pretty clear picture of the scope and content of the book. As you look through the book in this way, ask yourself some questions:

- What do I need to learn about this?
- What do I already know about this?
- How is this information related to information given in other chapters?
- How is this information related to the occupational standards?

5. When you have a general idea of what is in the training manual and how it is organized, fill in the details by intensive study. In each study period, try to cover a complete unit—it may be a chapter, a section of a chapter, or a subsection. The amount of material that you can cover at one time will vary. If you know the subject well, or if the material is easy, you can cover quite a lot at one time. Difficult or unfamiliar material will require more study time.

6. In studying any one unit—chapter, section, or subsection—write down the questions that occur to you. Many people find it helpful to make a written outline of the unit as they study, or at least to write down the most important ideas.

7. As you study, relate the information in the training manual to the knowledge you already have. When you read about a process, a skill, or a situation, try to see how this information ties in with your own past experience.

8. When you have finished studying a unit, take time out to see what you have learned. Look back over your notes and questions. Maybe some of your questions have been answered, but perhaps you still have some that are not answered. Without looking at the training manual, write down the main ideas that you have gotten from studying this unit. Don't just quote the book. If you can't give these ideas in your own words, the chances are that you have not really mastered the information.

9. Use nonresident career courses whenever you can. The courses are based on rate training manuals or on other appropriate texts. As mentioned before, completion of a mandatory rate training manual can be accomplished by passing a nonresident career course based on the rate training manual. You will probably find it helpful to take other courses, as well as those based on mandatory manuals. Taking a course helps you to master the information given in the training manual, and also helps you see how much you have learned.

10. Think of your future as you study rate training manuals. You are working for advancement to third class or second class right now, but some day you will be working toward higher rates. Anything extra that you can learn now will help you both now and later.

SOURCES OF INFORMATION

Besides training manuals, NAVEDTRA 10052 lists official publications on which you may be examined. You should not only study the sections required, but should become as familiar as possible with all publications you use.

One of the most useful things you can learn about a subject is how to find out more about it. No single publication can give you all the information you need to perform the duties of your rating. You should learn where to look for accurate, authoritative, up-to-date information on all subjects related to the naval requirements for advancement and the occupational standards of your rating.

TRAINING FILMS

Training films available to naval personnel are a valuable source of supplementary information on many technical subjects. Training films are listed in the *United States Navy Film Catalog*, NAVAIR 10-1-777 (formerly NAVWEPS 10-1-777), published in 1969. Copies may be ordered in accordance with the *Navy Stock List of Forms and Publications*, NAVSUP 2002. Monthly supplements to the Film Catalog are distributed to catalog holders. Medical Department films are available from the Audiovisual Resources Division of the HSETC, NNMC Bethesda, Maryland. The Film Catalogs are sent to all Naval Regional Medical Centers, Naval Hospitals, U. S. Naval Medical Centers, U. S. Naval Hospitals and others upon request.

When selecting a film, note its date of issue listed in the Film Catalog. As you know, procedures sometimes change rapidly. Thus some films become obsolete rapidly. If a film is obsolete only in part, it may sometimes be shown effectively if before or during its showing you carefully point out to trainees the procedures that have changed.

CHAPTER 2

ORIENTATION

MEDICAL DEPARTMENT OF THE NAVY

The Medical Department of the U.S. Navy is composed of commands and facilities devoted to providing medical and dental services. It includes the Bureau of Medicine and Surgery (BUMED), activities under the command or support of BUMED, and medical and dental departments of ships and stations under the command or support of other bureaus and offices.

The coordination and administration of all professional and technical medical, dental, and allied medical (health care) services of the Navy are centered in BUMED under the command of the Chief, Bureau of Medicine and Surgery (who is also the Surgeon General of the Navy). He is primarily responsible for providing all professional and technical guidance in the care and treatment of sick and injured Navy and Marine Corps personnel and their dependents, and other personnel as authorized by law.

As a hospital corpsman preparing for advancement, you are responsible for knowing the organizational structure and functions of the Navy Medical Department as well as the major medical department sections within your own duty station and supporting activities. You may consult the Manual of the Medical Department (NAVMED P-117) and the various BUMED 5450 series of instructions pertaining to organization, mission, and functions of command.

MEDICAL DEPARTMENT PERSONNEL

The Medical Department comprises the Medical Corps, Dental Corps, Medical Service Corps, Nurse Corps, Hospital Corps, and Dental Technicians. Each group is composed of personnel specialized appropriately to perform the designated duties for that group. The medical, dental, and related services and health programs for which the Medical Department is responsible are carried out by the personnel of the various corps, dental technicians, and civilians in the Bureau of Medicine and Surgery and in the field.

MEDICAL CORPS

The MEDICAL CORPS (MC) is composed of commissioned officers, the authorized number of which will be sixty-five one-hundredths of one percent of the sum of the total authorized number of commissioned officers (exclusive of commissioned warrant officers) and enlisted personnel of the Navy and Marine Corps, the total authorized number of midshipmen at the Naval Academy, the actual number of commissioned warrant officers and warrant officers on the active list of the Navy and Marine Corps, and the actual number of midshipmen on active duty for flight training. As of 1 January of each year, the Secretary of the Navy shall make computations to determine the authorized strength of the Medical Corps, and the number of officers so determined shall be considered the authorized number of officers until a subsequent computation is made for the next year. This authorized strength represents a maximum strength, and this number on an annual basis constitutes the "appropriated strength".

All officers of the Medical Corps are responsible for treating sick and injured personnel, for preventing and controlling disease, for promoting health, and for giving advice on such matters as hygiene, sanitation, and safety. Every officer of the Medical Corps must, therefore, stay informed in all fields of general and naval (operational) medicine.

DENTAL CORPS

The DENTAL CORPS (DC) is composed of commissioned officers, all of whom are graduates of a dental school approved by the American Dental Association or are currently licensed to practice dentistry in a State, the District of Columbia, Commonwealth of Puerto Rico, or a territory of the United States. The authorized number of Dental Corps officers on the active list is two-tenths of one percent of the sum of the total authorized strengths of the Navy and Marine Corps officers on the active lists, the total authorized strengths of the Regular Navy and Marine Corps enlisted members, the total authorized strength of the Navy midshipmen at the Naval Academy, the actual number of Commissioned warrant officers and warrant officers on the active list of the Navy and Marine Corps, and the actual number of midshipmen on active duty for flight training. The authorized strength of the Dental Corps is computed in the same manner as that of the Medical Corps.

The principal duty of the Dental Corps is to treat and prevent diseases, disabilities, and injuries of the jaws, teeth, and related structures. Dental officers are also responsible for conducting an organized program of preventive dentistry and dental health education for all personnel dependent on them for dental services.

MEDICAL SERVICE CORPS

The Medical Service Corps (MSC), a staff corps composed of commissioned officers, was created as a component of the Medical Department of the Navy to complement the functions of the Medical and Dental Corps. Members of the Medical Service Corps are governed by all laws and regulations pertaining to commissioned officers of other staff corps, except when specific exceptions are set forth. As determined by the Secretary of the Navy, the corps consists of Health Care Administration, Medical Allied Sciences, Medical Specialists, Optometry, Pharmacy, and Podiatry Sections. The Medical Allied Sciences Section includes specialists such as bacteriologists, chemists, entomologists, physiologists, and psychologists. The Medical Specialists Section comprises dietitians, physical therapists, and occupational therapists.

The total authorized number of the Regular officers of the corps is limited by law. The authorized active duty strength of the corps, including Regular, Reserve, and Temporary officers, is adjusted periodically as required. Hospital Corps personnel and dental technicians who possess such qualifications as may be prescribed by the Secretary of the Navy may be appointed to commissioned grades through the inservice procurement program. Other persons who possess such requisite qualifications and who are graduates of accredited schools or colleges, with degrees in sciences allied to medicine or such degrees that may be approved by the Surgeon General, may also be appointed to commissioned grades in the Medical Service Corps, through outservice procurement programs.

NURSE CORPS

The Nurse Corps (NC) is composed of commissioned officers who are graduates of the National League of Nursing accredited schools or are currently licensed to practice nursing care in a state, the District of Columbia, Commonwealth of Puerto Rico, or a territory of the United States. The authorized number of regular officers of the Nurse Corps is six-tenths of one percent of all authorized commissioned officers, enlisted personnel, midshipmen, and the actual number of all warrant officers of the Regular Navy and Marine Corps.

The primary mission of the Navy Nurse Corps is to provide professional nursing care to, and promote the health of, Navy and Marine Corps personnel, their dependents, and others as authorized by law. In addition, the Nurse Corps trains and supervises Hospital Corps personnel in the practice of nursing care.

HOSPITAL CORPS

The Hospital Corps, as it is now known, was established within the Medical Department of the Navy under the provisions of an Act of Congress approved on 17 June 1898 (ch. 463, sec. 1, 30 Stat. 474). It is unique in that it is the only enlisted corps in the U.S. Navy. The strength of the corps is determined by the NMPC within the personnel allocations authorized by the Chief of Naval Operations who implements the statutory restrictions on the total Hospital Corps strength.

For more than three-quarters of a century, hospital corpsmen (HM) have played an essential role in protecting and maintaining the health and well-being of their fellow sailors and marines. In peace and in wartime, the heritage of the Hospital Corps has been a proud one. This is reflected by the courage and bravery of the disproportionately high number of hospital corpsmen who have received the Medal of Honor, and by the continuing history of goodwill shown toward "Doc" by those served.

The duties of the Hospital Corps personnel are governed by U.S. Navy Regulations and the Geneva Convention of August 12, 1949, which provide for the care of the sick and injured, prevention of disease or injury, and the administration of medical departments, divisions, or commands. These duties shall be performed under the supervision of Medical Department officers, excluding Hospital Corps personnel serving on independent duty.

Today the Hospital Corps is an organization of skilled personnel trained to carry out many varied assignments of a technical nature in the field of military medical service. They function in hospitals, dispensaries, combat ships, submarines, and airplanes, with paratroops, commando and amphibious Marine Corps units storming beachheads, and in other aspects of warfare requiring the highest standards of courage, training and efficiency.

DENTAL TECHNICIANS

The DENTAL TECHNICIAN rating was established as a separate occupational group in the rating structure by the Secretary of the Navy on 12 December 1947, effective 20 April 1948.

The Dental Technician rating is comprised of enlisted personnel trained to assist naval dental officers in providing such care for active duty Navy and Marine Corps personnel that will prevent or remedy diseases, disabilities, and injuries of the teeth, jaws, and related structures, which may directly or indirectly interfere with the performance of military duties.

Dental technicians are assigned to Naval Regional Dental Centers, Naval Regional Medical Centers, dental departments of ships and stations, Fleet Marine Force dental companies, and mobile construction battalions as technical assistants to dental officers. The authorized strength of the Dental Technician rating is determined in the same manner as that of the Hospital Corps by NMPC.

CHAPTER 3

ANATOMY AND PHYSIOLOGY

INTRODUCTION

Knowledge of how the human body is constructed and how it works is an important part of the training of everyone concerned with healing the sick or managing emergency conditions following injury. This chapter will provide you with a general knowledge of the structures and functions of the body.

The human body is a combination of organ systems with a supporting framework of muscles and bones and an external covering of skin. The study of the body is divided into:

Anatomy—The study of body structures and the relation of one part to another.

Physiology—the study of the processes and functions of the body tissues and organs. Basically, it is the study of how the body works—how the various parts function individually and in relation to each other.

Embryology—the study of the development of the body from a fertilized egg, or ovum.

TERMS OF POSITION AND DIRECTION

The planes of the body are imaginary lines dividing it into sections. They are used as reference points in locating anatomical structures. As shown in figure 3-1, the MEDIAN, or MIDSAGITTAL, PLANE divides the body into right and left halves on its vertical axis. This plane passes through the sagittal suture of the cranium, therefore, any plane parallel to it is called a SAGITTAL PLANE. FRONTAL PLANES are drawn perpendicular to the saggital lines and divide the body into anterior and posterior sections. Since this line passes through the coronal suture of the cranium, frontal planes are also called CORONAL PLANES. The HORIZONTAL, or TRANSVERSE, PLANE, which is drawn at right angles to both saggital and frontal planes, divides the body into superior and inferior sections.

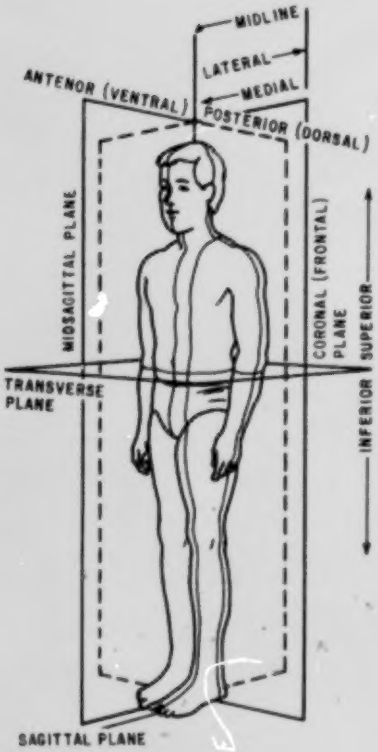

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Figure 3-1.—Planes of the Body.

To avoid misunderstanding in describing the location of anatomical structures, a standard body position, called the ANATOMICAL POSITION, is used as a point of reference. This anatomical position is assumed when the body stands erect, arms hanging at the sides, and palms of the hands turned forward (fig. 3-2).

Other commonly used anatomical terms include the following:

Anterior or ventral—toward the front, or ventral (pertaining to the belly; abdomen), side of the body.

Posterior or dorsal—toward the back, or dorsal, side of the body.

Medial—near or toward the midline of the body.

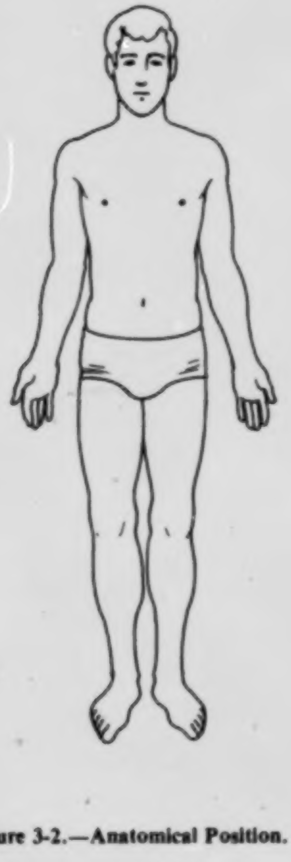

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Figure 3-2.—Anatomical Position.

Lateral—farther away from the midline of the body.

Internal—inside.

External—outside.

Proximal—nearer the point of origin or closer to the body.

Distal—away from the point of origin or away from the body.

Superior—higher than or above.

Cranial—toward the head.

Caudal—toward the lower end of the body.

Inferior—lower than or below.

Erect—normal standing position of the body.

Supine—lying position of the body, face up.

Prone—lying position of the body, face down.

Lateral recumbent—lying position of the body, on either side.

Periphery—the outward part or surface of a structure.

CHARACTERISTICS OF LIVING MATTER

All living things, animals and plants, are ORGANISMS that undergo chemical processes by which they sustain life and regenerate cells. The difference between them is that animals have sensation and the power of voluntary movement, and require oxygen and organic food. Plants require only carbon dioxide and inorganic matter for food, and have neither voluntary movement nor special sensory organs.

In man, some of the characteristc functions necessary to survival include digestion, metabolism, and homeostasis. DIGESTION involves the physical and chemical breakdown of the food we eat into its simplest forms. METABOLISM is the process of absorption, storage, and use of these foods for body growth, maintenance, and repair. HOMEOSTASIS is the body's self-regulated control of its internal environment. It allows the organism to maintain a state of constancy or equilibrium, in spite of vast changes in the external environment.

THE CELL

The smallest unit of life, the cell, is the basic structural unit of all living things and a functional unit all by itself. It is composed of a viscid, jellylike substance, called PROTOPLASM, upon which depend all the vital functions of nutrition, secretion, growth, circulation, reproduction, excitability, and movement. As such, protoplasm has been called "the secret of life."

A typical cell is made up of the plasma membrane, a nucleus, and the cytoplasm.

The PLASMA MEMBRANE is a selectively permeable membrane surrounding the cell. In addition to holding the cell together, the membrane selectively controls the exchange of materials between the cell and its environment by physical and chemical means. Solids and gases, such as oxygen, proteins, carbohydrates, and mineral salts, pass through the plasma membrane by a process known as DIFFUSION.

The NUCLEUS is a small, dense, usually spherical body that controls the chemical reactions occurring in the cell. It is also important in the cell's reproduction, since genetic information for the cell is stored there. Every human cell contains 46 chromosomes, and each chromosome has thousands of genes that determine the cell's function.

The CYTOPLASM is a water-to-gelatinous mass surrounding the nucleus and contained by the plasma membrane. The cytoplasm, then, is all of the cell protoplasm except the nucleus.

The simplest living organism consists of a single cell. The amoeba is a unicellular animal. The single cell of such a one-celled organism must be able to carry on all processes necessary for life. This cell is called a SIMPLE or UNDIFFERENTIATED CELL.

In multicellular organisms cells vary in size, shape, and number of nuclei. When stained, the various cell structures can be more readily recognized under a microscope. Other differences such as the number and type of cells can be seen with the aid of a microscope. Many cells are highly specialized. SPECIALIZED CELLS perform special functions, such as muscle, which contracts, or epithelial cells of the skin, which protect.

TISSUES

Tissues are groups of specialized cells similar in structure and function. They are classified in five main groups: epithelial, connective, muscular, liquid, and nervous.

1. EPITHELIAL. The lining tissue of the body is called epithelium. It forms the outer covering of the body known as the free surface of the skin. It also forms the lining of the digestive, respiratory, and urinary tracts, blood and lymph vessels, serous cavities, and tubules of such secretory glands as the liver and kidneys. This tissue has little intercellular fluid and may be further subdivided into three types:

a. Columnar. The chief function of this tissue is the secretion of digestive fluids and the absorption of digested foods and fluids. It consists of long narrow cells set close together, resembling a palisade-type fence (fig. 3-3). In certain areas such as the nostrils, bronchial tubes, and trachea, this tissue has a crown of microscopic hairlike processes known as cilia. These cilia provide motion to move secretions and other matter along the surfaces from which they extend. They also act as a barrier, preventing foreign matter from entering these cavities.

b. Squamous. This is the main protective tissue of the body. It is composed of thin platelike or scalelike cells forming a mosaic pattern (fig. 3-4). This tissue is found in the tympanic membrane (eardrum) as a single layer of cells or in the free skin surface in multiple layers.

c. Cuboidal. This is both a secretory and protective tissue whose cells are cubical (fig.

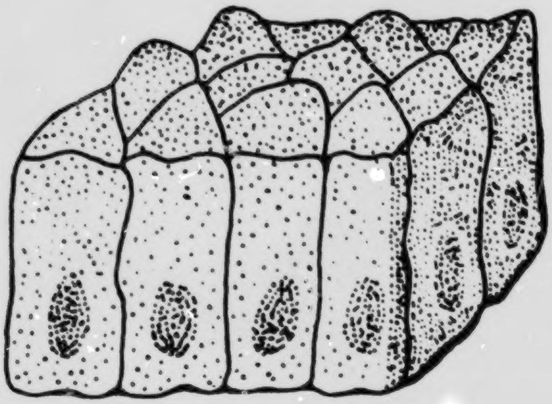

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Figure 3-3.—Columnar Epithelial Tissue.

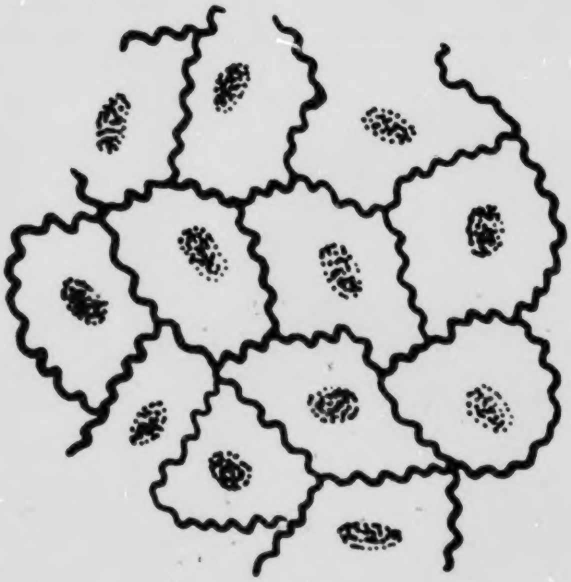

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Figure 3-4.—Squamous Epithelial Tissue.

3-5). It is found in the more highly specialized organs of the body, such as the ovary and the kidney.

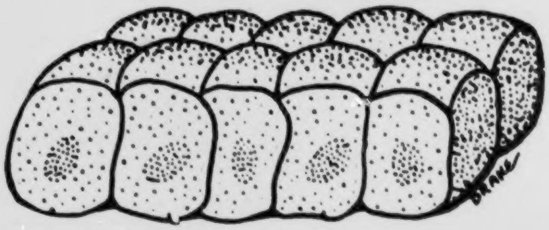

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Figure 3-5.—Cuboidal Epithelial Tissue.

2. CONNECTIVE. This is the supporting tissue of the various structures of the body. It has many variations and is the most widespread tissue of the body. It is highly vascular, surrounds other cells, encases internal organs, sheathes muscles, wraps bones, encloses joints, and provides the supporting framework of the body. Structures of connective tissue differ widely, ranging from delicate tissue-paper membranes to strong, tough cords and rigid bones. Connective tissue is composed of few cells and large amounts of intracellular material; the reverse is true of epithelial tissue.

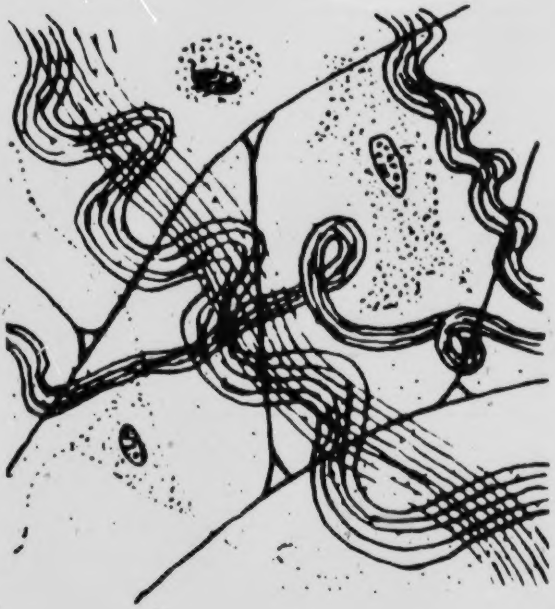

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Figure 3-6.—Areolar Connective Tissue.

Some of the more predominant types of connective tissues are:

a. Areolar. This tissue connects the various tissues of the organs. It is continuous throughout the body. Nerves, blood, and lymph vessels are found in this tissue (fig. 3-6).

b. Adipose. This tissue is generally called "fatty tissue." It acts as a reservoir for energy-producing foods, helps to reduce body heat loss because of its poor heat conductivity, and serves as support for various organs and fragile structures such as the kidneys, blood vessels, and nerves.

c. Osseous. A more dense fibrous connective tissue which forms tendons, ligaments, cartilage, and bone (fig. 3-7). These tissues form the supporting framework of the body.

3. MUSCULAR. Muscular tissue provides for all body movement. There are two types, voluntary and involuntary.

a. Voluntary muscle fibers are striated, or striped, and are under the control of the individual's will (fig. 3-8).

b. Involuntary muscle fibers are smooth, or nonstriated, and are not under the control of the individual's will (fig. 3-9). The muscles of the stomach are an example.

NOTE: The heart (cardiac) muscle is composed of a special, branched type of cell, which is involuntary, although striated (fig. 3-10).

4. LIQUID. Liquid tissues act as a medium for supplying the body with nutrients and as a vehicle for eliminating waste materials. They form the blood, lymph, and tissue fluids.

5. NERVOUS. Nervous tissue is the most complex tissue in the body. It is the substance of the brain, spinal cord, and nerves. Nervous tissue requires more oxygen and nutrients than

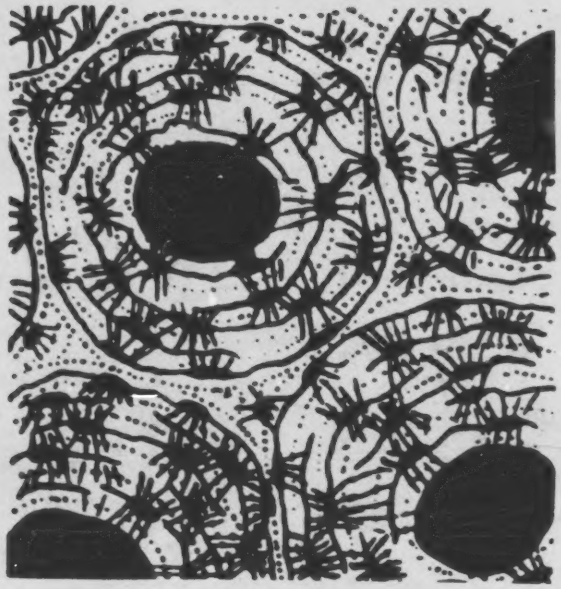

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Figure 3-7.—Osseous (Bone) Tissue.

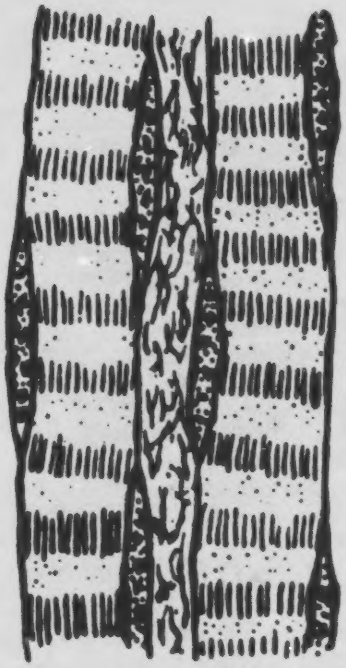

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Figure 3-8.—Striated (Voluntary) Muscle.

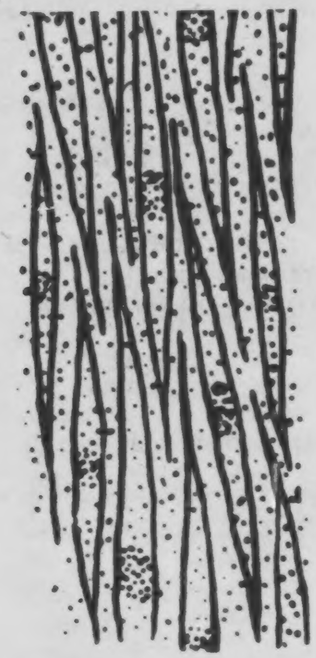

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Figure 3-9.—Non-striated (Involuntary) Muscle.

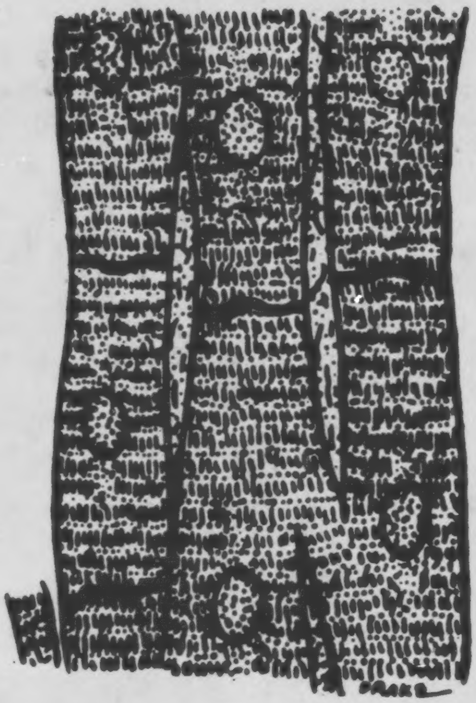

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Figure 3-10.—Cardiac Muscle.

any other body tissue. The basic cell of the nervous tissue is the neuron (fig. 3-11). This highly specialized cell receives stimuli from, and conducts impulses to, all parts of the body.

ORGANS

As groups of similar cells form tissues, similar tissues form organs such as the heart, liver, and kidneys. These organs are grouped together to form systems, such as the urinary system that is composed of the kidneys, ureters, bladder, and urethra.

THE SKELETAL SYSTEM

The skeleton is the bony framework of the body, composed of 206 bones (fig. 3-12). It supports and gives shape to the body, protects vital organs, and provides sites of attachment for

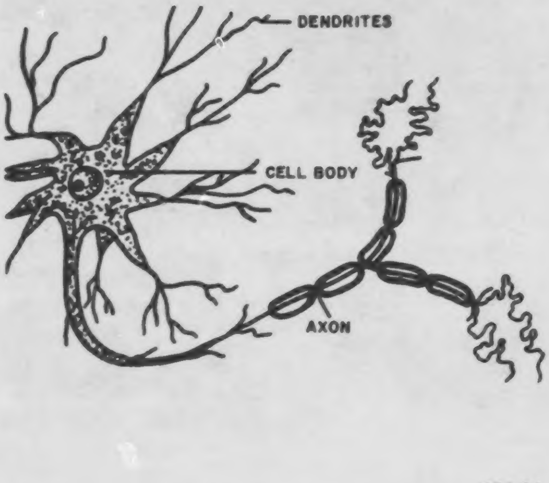

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Figure 3-11.—Neuron.

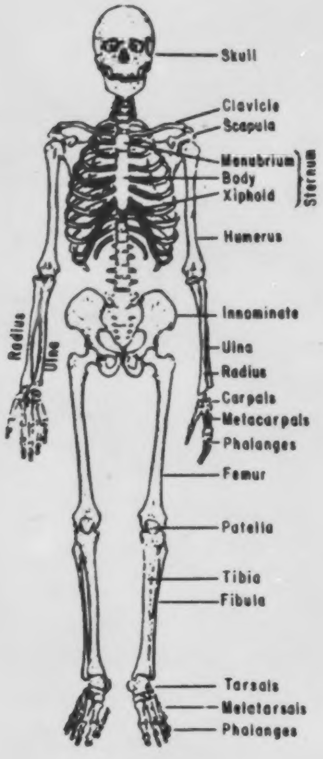
Skull
Clavicle
Scapula
Menubrium
Body
Xiphoid
Sternum
Humerus
Innominate
Ulna
Radius
Carpals
Metacarpals
Phalanges
Femur
Patella
Tibia
Fibula
Tarsals
Metatarsals
Phalanges
Radius
Ulna

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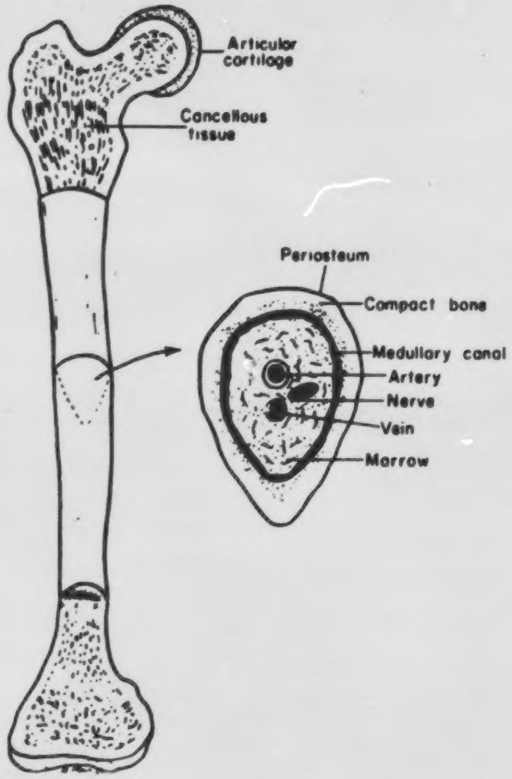
Figure 3-12.—Human skeleton.


Articular cartilage
Cancellous tissue
Periosteum
Compact bone
Medullary canal
Artery
Nerve
Vein
Marrow

154.86

Figure 3-13.—Structure of a Typical Long Bone.

tendons, muscles, and ligaments. The skeletal bones are joined members that make muscle movement possible.

BONES

OSTEOLOGY is the study of the structure of bone. Bone is made up of calcium, phosphorus, and other mineral salts, and an organic substance called ossein. When human bone is soaked in dilute acid until all inorganic mineral salts are washed out, all that remains is a flexible piece of tissue that can easily be bent and twisted. Bone, therefore, depends upon inorganic mineral salts such as calcium and phosphorus for its strength and hardness.

Bone consists of a hard outer shell, called compact tissue, and an inner spongy, porous portion, called cancellous tissue (fig. 3-13). In the center of the bone is the MEDULLARY CANAL, which contains marrow. There are two types of marrow, red and yellow. Yellow marrow is ordinary bone marrow in which fat cells predominate. It is found in the medullary canals and cancellous tissue of long bones. Red marrow is one of the manufacturing centers of red blood cells and is found in the articular ends of long bones and in cancellous tissue. At the ends of the long bones is a smooth, glossy tissue that forms the joint surfaces. This tissue is called articular cartilage, because it articulates (joins) with, fits into, or moves in contact with similar surfaces of other bones. The thin outer membrane surrounding the bone is called the PERIOSTEUM. An important function of the periosteum is to supply nourishment to the bone. Capillaries and blood vessels run through the periosteum and dip into the bone surface, supplying it with blood and nourishment. The periosteum is the pain center of the bone. When there is a fracture, the pain you feel comes from the periosteum, not the bone proper. Periosteum also forms new bone.

CLASSIFICATION. Bones are classified according to shape, as follows:

- Long—femur and humerus
- Short—wrist and ankle bones
- Flat—skull, sternum, and scapula
- Irregular—vertebrae, mandible, hyoid, and pelvic bones

AXIAL SKELETON

The axial skeleton consists of the skull, the vertebral column, and the thorax. The skull bones are further divided into the cranial and facial bones.

THE SKULL

The skull consists of 28 bones (fig. 3-14 and 3-15), 22 of which form the framework of the head and provide protection for the brain, eyes, and ears; six are ear bones. With the exception of the lower jaw bone (mandible) and the ear bones, all skull bones are joined together and fixed in one position. The seams where they join are known as sutures.

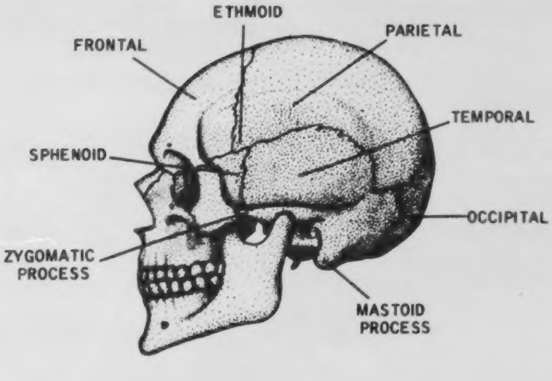


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Figure 3-14.—Lateral View of the Skull.

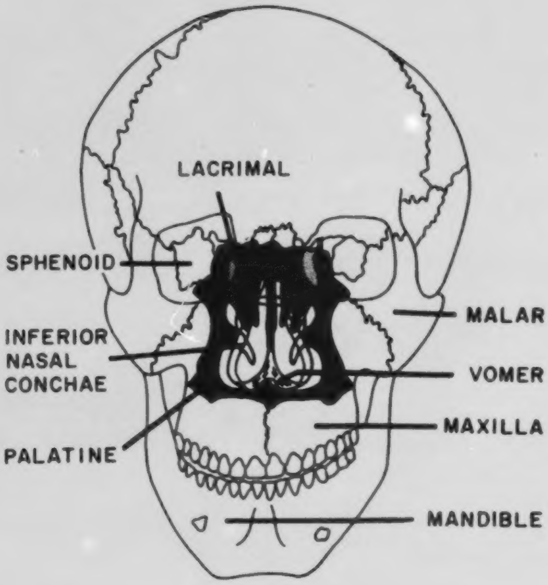

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Figure 3-15.—Frontal Bones.

CRANIAL BONES

The skull is formed by eight cranial bones, six of which are essential to know. The FRONTAL BONE, which forms the forehead, contains the frontal sinuses and helps form the eye socket and nasal cavity. The two PARIETAL BONES form the roof of the skull. The two TEMPORAL BONES, which help form the sides and base of the skull, also house the auditory, or hearing organs. The OCCIPITAL BONE forms part of the base and back of the skull and contains a large hole, called the FORAMEN MAGNUM. This opening permits passage of the spinal cord from the cranium into the spinal column.

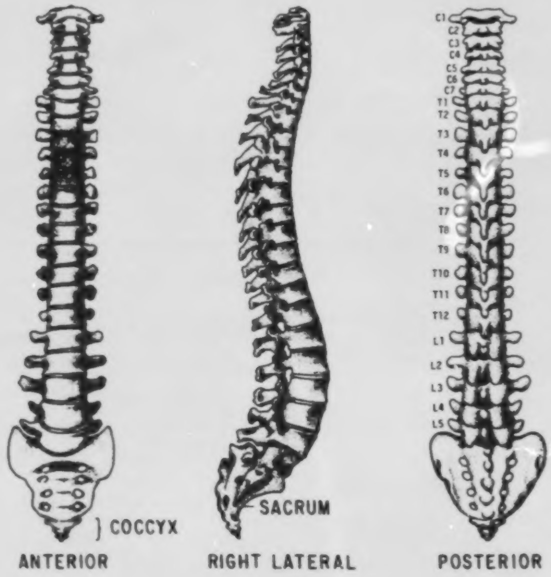
FACIAL BONES

The two MAXILLARY BONES form the upper jaw, nasal walls, and part of the eye socket. These bones contain large cavities called maxillary sinuses. Frequently these sinuses become infected, causing the individual much discomfort. The lower jaw is called the MANDIBLE. Its main function is mastication. Other bones of the face are the LACRIMAL and NASAL BONES.

THE VERTEBRAL COLUMN

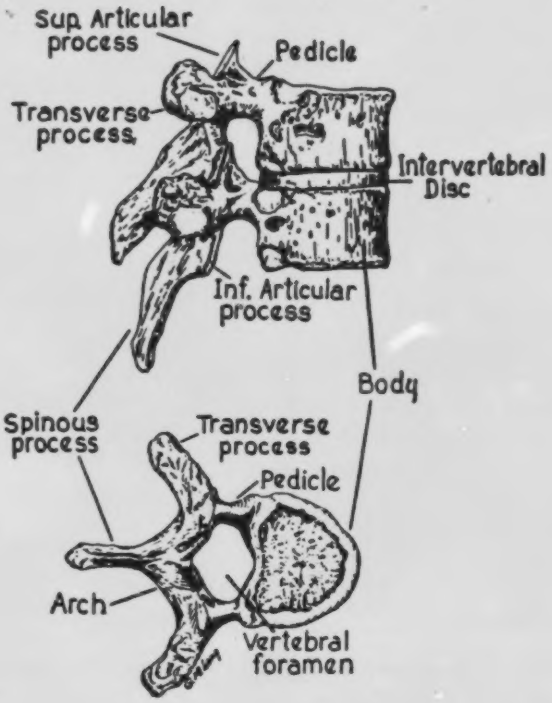
The vertebral (spinal) column consists of 24 movable or true vertebrae, the sacrum, and the coccyx, or tail bone (fig. 3-16).The spinal column is divided into five regions: cervical (neck), thoracic (chest), lumbar (lower back), and sacral and coccygeal (pelvis).

The vertebrae protect the spinal cord and the nerves arising from the spinal cord. Each vertebra has an anterior portion, the body, which is the large solid segment of the bone (fig. 3-17). This body is for support, not only for the spinal cord but for the other structures of the body as well. Many of the main muscles are attached to the vertebrae. The vertebral foramen is a hole directly behind the body of the vertebrae and forms the passage for the spinal cord. The vertebral projections are for the attachment of muscles and ligaments and to facilitate movement of one vertebra over another.


C1
C2
C3
C4
C5
C6
C7
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
L1
L2
L3
L4
L5
SACRUM
COCCYX
ANTERIOR
RIGHT LATERAL
POSTERIOR

154.89

Figure 3-16.—Vertebral Column.


Sup. Articular process
Pedicle
Transverse process
Intervertebral Disc
Inf. Articular process
Body
Spinous process
Transverse process
Pedicle
Arch
Vertebral foramen

154.90

Figure 3-17.—Vertebra Structure.

There are seven cervical vertebrae in the neck. The first is called the ATLAS and resembles a bony ring. It supports the head. The second is the highly specialized AXIS. It has a bony prominence that fits into the ring of the atlas, thus permitting the head to rotate from side to side. The atlas and the axis are the only named vertebrae, all others are numbered. Each cervical vertebra has a transverse foramen to allow passage of nerves, the vertebral artery, and a vein. The seventh cervical vertebra has an especially prominent projection that can easily be felt at the nape of the neck. This makes it possible for physicians to count and identify the vertebrae above and below it.

There are 12 vertebrae in the thoracic region. These articulate with the posterior portion of the 12 ribs to form the posterior wall of the thoracic, or chest, cage.

There are five lumbar vertebrae, which are the largest segments of the vertebral column.

The SACRUM is triangular and is formed by the fusion of five false vertebrae. It articulates on each side with the hip bone and with the COCCYX to form the posterior wall of the PELVIS.

THE THORAX

The THORAX is a cone-shaped bony cage, about as wide as it is deep (fig. 3-18). It is formed by 12 ribs on each side, which articulate posteriorly with the thoracic vertebrae. The first seven pairs of ribs are attached to the sternum by cartilage and are called true ribs. The eight, ninth, and tenth ribs are united by their cartilages to the cartilage of the seventh rib and are called false ribs. The last two ribs are unattached in front and are called floating ribs.

The STERNUM is an enlongated flat bone, forming the middle portion of the upper half of the chest wall in front. The xiphoid process, located at the inferior aspect of the sternum, serves as a landmark in the administration of cardiopulmonary resuscitation.

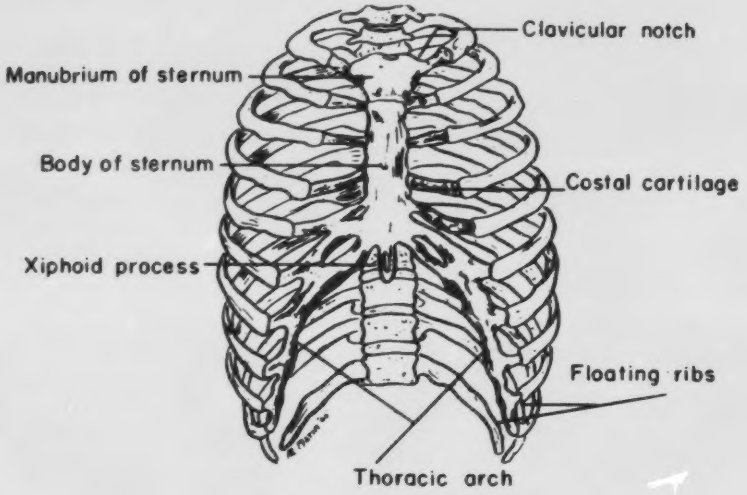
APPENDICULAR SKELETON

The appendicular skeleton consists of the bones of the upper and lower extremities.

Upper Extremities

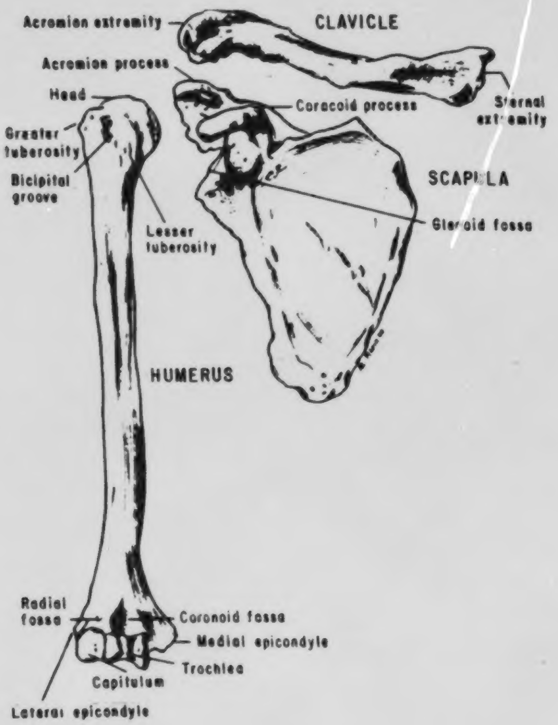
The upper extremity consists of the shoulder, the arm, the forearm, the wrist, and the hand (figs. 3-19 and 3-20). The bones that form the framework for the upper extremity are:

Clavicle	collar bone	2
Scapula	shoulder blade	2
Humerus	arm bone	2
Radius and ulna	forearm bones	4
Carpals	wrist bones	16
Metacarpals	bones of the palm	10
Phalanges	finger bones	28



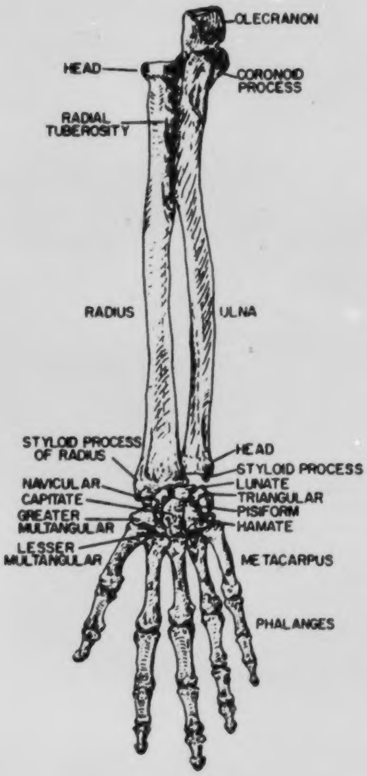
154.91

Figure 3-18.—Thorax, Anterior View.


Acromion extremity
CLAVICLE
Acromion process
Head
Coracoid process
Sternal extremity
Greater tuberosity
Bicipital groove
SCAPULA
Lesser tuberosity
Glenoid fossa
HUMERUS
Radial fossa
Coronoid fossa
Medial epicondyle
Trochlea
Capitulum
Lateral epicondyle

154.92

Figure 3-19.—Shoulder Girdle and Arm Bone.


OLECRANON
HEAD
CORONOID PROCESS
RADIAL TUBEROSITY
RADIUS
ULNA
STYLOID PROCESS OF RADIUS
HEAD
STYLOID PROCESS
NAVICULAR
LUNATE
CAPITATE
TRIANGULAR
GREATER MULTANGULAR
PISIFORM
HAMATE
LESSER MULTANGULAR
METACARPUS
PHALANGES

154.93

Figure 3-20.—Forearm and Hand.

The CLAVICLE forms the front part of the shoulder girdle. It lies nearly horizontally just above the first rib and is shaped like a flat letter S. The clavicle is a thin brace bone that fractures easily. Its inner end is round and attached to the sternum; its outer end is flattened and fixed to the scapula.

The SCAPULA is a triangular bone that lies in the upper part of the back on both sides, between the second and seventh ribs, forming the posterior portion of the shoulder girdle. Its lateral corner forms part of the shoulder joint, articulating with the humerus.

The HUMERUS is the longest bone of the upper extremity and is often called the arm bone. It articulates with the shoulder girdle to form the shoulder joint and with the bones of the forearm to form the elbow. Its anatomical portions include a head, a rounded portion that fits into a recess of the scapula called the glenoid fossa; the greater and lesser tuberosities, which are enlargements of the superior end; the surgical neck, a slight narrowing distal to the tuberosities and a frequent site of fractures; the shaft, which is the main part of the humerus; and the distal end, which includes the prominences called epicondyles and the surfaces that articulate with the bones of the forearm.

When the arm is in the anatomical position with the palm turned forward, the RADIUS is on the lateral, or thumb, side and the ULNA is on the medial, or little finger, side of the forearm. When the hand is pronated (palm turned downward), the bones rotate on each other and cross in the middle. This makes it possible to turn the wrist and hand as in opening doors. The ulna and the radius articulate at their proximal ends with the humerus, at their distal ends with some of the carpal bones, and with each other at both ends.

There are eight CARPAL bones, arranged in two rows, forming the wrist.

The METACARPAL bones are numbered one to five corresponding with the five fingers, or digits, with which they articulate. The fingers are named as follows: 1st - thumb; 2nd - index; 3rd - middle; 4th - ring; and 5th - little.

The small bones of the fingers are called PHALANGES. Each finger has three bones, except the thumb, which has two. The bone at the end of the finger is called the distal phalanx; the one closest to the hand is called the proximal phalanx; and the one in between is called the middle phalanx.

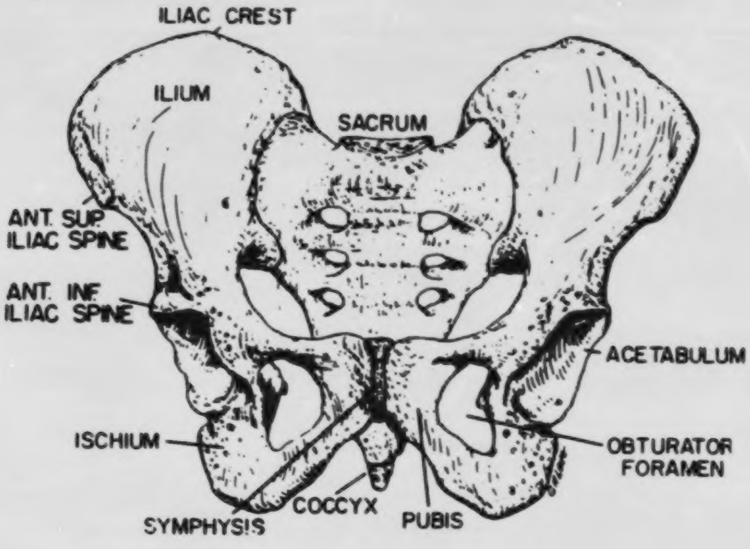
Lower Extremities

The lower extremity includes the hip, thigh, leg, ankle, and foot (figs. 3-21 and 3-22). The bones that form the framework of the lower extremities are:

Innominate	hip bone	2
Femur	thigh bone	2
Patella	knee cap	2
Tibia	leg bone	2
Fibula	leg bone	2
Tarsals	ankle bones	14
Metatarsals	foot bones	10
Phalanges	toe bones	28

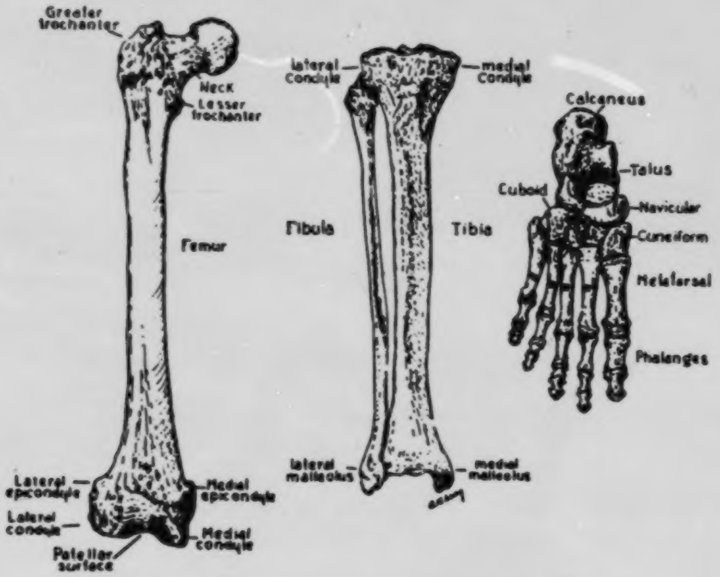
The hip, or INNOMINATE BONE, is a large, irregularly shaped bone composed of three parts: the ilium, ischium, and pubis. In children these three parts are separate bones, but in adults they are firmly united to form a cuplike structure, called the ACETABULUM, into which the head of the femur fits. The ILIUM forms the outer prominence of the hip bone (crest of the ilium), the ISCHIUM forms the hard lower part, and the PUBIS forms the front part of the pelvis.

The area where the two pubic bones meet is called the SYMPHYSIS PUBIS and is often used in anatomical measurements. The largest



154.94

Figure 3-21.—Pelvic Girdle.


Greater trochanter
Neck
Lesser trochanter
Femur
Lateral epicondyle
Medial epicondyle
Lateral condyle
Medial condyle
Patellar surface
lateral Condyle
medial Condyle
Fibula
Tibia
lateral malleolus
medial malleolus
Calcaneus
Talus
Cuboid
Navicular
Cuneiform
Metatarsal
Phalanges

154.95

Figure 3-22.—Bones of the Lower Extremity.

foramen (opening) is located in the hip bone, between the ischium and the pubis, and is called the OBTURATOR FORAMEN. The crest of the ilium is used in making anatomical and surgical measurements (e.g., location of the appendix, which is approximately halfway between the crest of the ilium and the umbilicus).

The FEMUR, or thigh bone, is the longest bone in the body. The proximal end is rounded and has a head supported by a constricted neck that fits into the acetabulum. Two processes called the GREATER and LESSER TROCHANTERS are at the proximal end for the attachment of muscles. The neck of the femur, located between the head and the trochanters, is the site most frequently fractured. At the distal end are two bony prominences called the LATERAL and MEDIAL CONDYLES, which articulate with the tibia and the patella.

The PATELLA is a small oval-shaped bone overlying the knee joint. It is enclosed with the tendon of the quadriceps muscle of the thigh. Bones like the patella that develop within a tendon are known as SESAMOID bones.

The TIBIA, or shinbone, is the larger of the two leg bones and lies at the medial side. The proximal end articulates with the femur and the fibula. Its distal end articulates with the talus (one of the foot bones) and the fibula. A prominence easily felt on the inner aspect of the ankle is called the MEDIAL MALLEOLUS.

The FIBULA, the smaller of the two leg bones, is located on the lateral side of the leg, parallel to the tibia. The prominence at the distal end forms the outer ankle, known as the LATERAL MALLEOLUS.

The TARSUS, or ankle, is formed by seven tarsal bones. The strongest of these is the heel bone or CALCANEUS.

The sole and instep of the foot is called the METATARSUS and is made up of five METATARSAL bones. They are similar in arrangement to the metacarpals of the hand.

The PHALANGES are the bones of the toes and are similar in number, structure, and arrangement to the bones of the fingers.

JOINTS

Wherever two bones are attached to each other, a joint is formed. In a freely movable joint, such as the knee or elbow joint, the ends of the bones are covered with a smooth layer of cartilage. The whole joint is enclosed in a watertight sac or membrane containing a small amount of lubricating fluid. This enables the joint to work with little friction. The ligaments that reach across the joints from one bone to another keep them from getting out of place. When ligaments are accidentally torn, we call the injury a sprain; when bones are out of place, there is a dislocation; and when bones are chipped or broken, the injury is called a fracture.

Joints are classified according to the amount of movement they permit (fig. 3-23). They may be:

IMMOVABLE. Bones of the skull are rigidly interlocked along immovable joint lines known as sutures.

SLIGHTLY MOVABLE. In these joints the bones are held together by broad flattened disks of cartilage and ligaments (e.g., vertebrae and symphysis pubis).

FREELY MOVABLE. Such joints include the knee, hip, and shoulder. These joints are further subdivided into:

HINGE JOINTS. . .elbow and knee

BALL-AND-SOCKET JOINTS. . . shoulder and hip

JOINT MOVEMENTS

Joint movements are generally divided into four types:

GLIDING is the simplest type of motion. It is one surface moving over another without any rotary or angular motion. This motion exists between two contiguous or adjacent surfaces.

ANGULAR motion decreases or increases the angle between two adjoining bones. The more common types of angular motion are:

Flexion—bending the arm or leg.

Extension—straightening or unbending, as in straightening the forearm, leg, or fingers.

Abduction—moving an extremity away from the body.

Adduction—bringing an extremity toward the body.

ROTATION is a movement in which the bone moves around a central point without being displaced, such as turning the head from side to side.

CIRCUMDUCTION is the movement of the hips and shoulders.

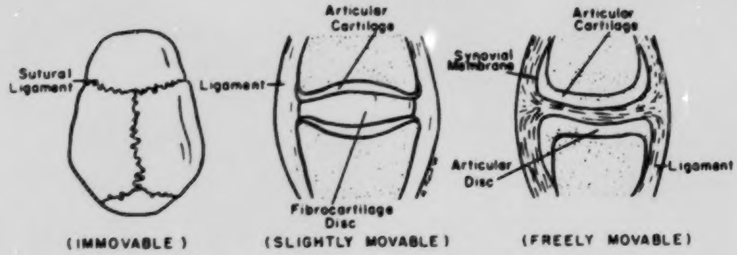


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Figure 3-23.—Typical Joints.

Other types of movement generally used to indicate specific anatomical positions include the following:

SUPINATION—turning upward, as in placing the palm of the hand up.

PRONATION—turning downward, as in placing the palm of the hand down.

EVERSION—turning outward, as in turning the sole of the foot to the outside.

INVERSION—turning inward, as in turning the sole of the foot inward.

MUSCLES

Muscles make up about one-half of the total body weight. Their main functions are threefold:

1. Providing movement, including internal functions such as peristalsis in the intestines.

2. Maintaining body posture through muscle tone, as in the muscles of the head, neck, and shoulders, which keep the head up.

3. Providing heat through chemical changes that take place during muscle activity, such as mild exercise that warms the body on cold days.

In addition, muscles are involved in such essential bodily functions as respiration, blood circulation, digestion, and even such functions as speaking and seeing.

At one end of some muscles are long white TENDONS that attach the muscle to bone. The point of fixed attachment of a muscle to bone is called the ORIGIN. The more flexible attachment, especially to a movable bone, is termed the INSERTION.

Muscle tissue has a highly developed ability to contract. CONTRACTABILITY enables a muscle to become shorter or thicker, and this ability, along with interaction with other muscles, produces movement in internal and external body parts. Muscle contraction in a tissue or organ produces motion and provides power and speed for body activity. A contracting muscle is referred to as a PRIME MOVER. A muscle that is relaxing while a prime mover is contracting is called the ANTAGONIST. Muscular tone, or TONICITY, gives muscles a certain firmness, or a continual state of partial contraction. ISOMETRIC muscle contractions occur when the muscle is stimulated and shortens, but no movement occurs, as when a person tenses his or her muscles against an immovable object. Muscles are also capable of stretching when force is applied (EXTENSIBILITY) and regaining their original form when that force is removed (ELASTICITY).

All types of muscles respond to stimulus. This property is called EXCITABILITY or IRRITABILITY. The mechanical muscular action of shortening or thickening is activated by a stimulus sent through a motor nerve. All muscles are linked to nerve fibers that carry messages from the central nervous system.

The chemical action of muscle fibers consists of two stages, CONTRACTION and RECOVERY. In the contraction stage two protein substances (actin and myosin) react to provide energy. In the recovery stage oxygen and glycogen are used to provide energy and to react with lactic acid, which releases carbon dioxide and water.

When a muscle contracts, it produces chemical waste products (carbon dioxide, lactic acid, and acid phosphate), which make the muscle more irritable. If contraction is continued, the muscle will finally cramp up and refuse to move. This condition is known as fatigue. If it is carried too far, the muscle cells will not recover and permanent damage will result. Muscles, therefore, need rest to allow the blood to carry away the waste materials and bring in fresh glucose, oxygen, and protein to restore the muscle protoplasm and the energy that was used.

The importance of exercise for normal muscle activity is clear, but excessive muscle strain is damaging. For example, if a gasoline motor stands idle, it eventually becomes rusty and useless. Similarly, a muscle cell that does not work becomes weak and flabby. On the other hand, a motor that is never allowed to stop and is forced to run too fast or to do too much heavy work soon wears out so that it cannot be repaired. In the same way, a muscle cell that is forced to work too hard without proper rest will be damaged beyond repair. Violent exercise is never good. Exercise should be adapted to the individual and should never be caried to the point of extreme fatigue.

During exercise, massage, or ordinary activities, the blood supply of muscles is increased. This brings in fresh nutritional materials, carries away waste products more rapidly, and enables the muscles to build up and restore their efficiency and tone.

When a muscle dies, it becomes solid and rigid and no longer reacts. This stiffening, which occurs from 10 minutes to several hours after death, is called RIGOR MORTIS.

Muscles seldom act alone; they usually work in muscle groups held together by sheets of a white fibrous tissue called FASCIA. There are three types of muscle tissue: skeletal, smooth, and cardiac. Each is designed to perform a specific function.

SKELETAL MUSCLES are attached to the bones and give shape to the body. They are responsible for allowing body movement. This type of muscle is sometimes referred to as STRIATED because of the striped appearance of the muscle fibers under a microscope (fig. 3-24). They are also called VOLUNTARY muscles because they are under the control of our conscious will. These muscles can develop great power.

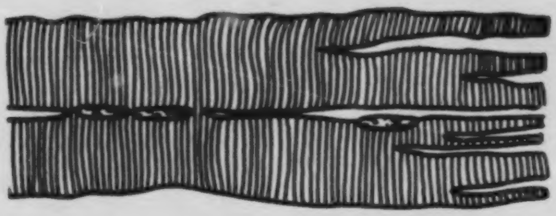

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Figure 3-24.—Striated Muscle Fibers.

SMOOTH, or NONSTRIATED, muscle tissues are found in the walls of the stomach, intestines, urinary bladder, and blood vessels, as well as in the ducts of glands and in the skin. Under a microscope the smooth muscle fiber lacks the striped appearance of other muscle tissue (fig. 3-25). This tissue is also called INVOLUNTARY muscle because it is not under conscious control.

The CARDIAC MUSCLE tissue forms the bulk of the walls and septa (partitions) of the heart, as well as the origins of the great blood vessels. The fibers of the cardiac muscle differ from those of the skeletal and smooth muscles in that they are shorter and branch into a complicated network (fig. 3-26). The cardiac muscle has the most abundant blood supply of any muscle in the body, receiving twice the blood flow of the highly vascular skeletal muscles and far more than the smooth muscles. Cardiac muscles contract to pump blood out of the heart and

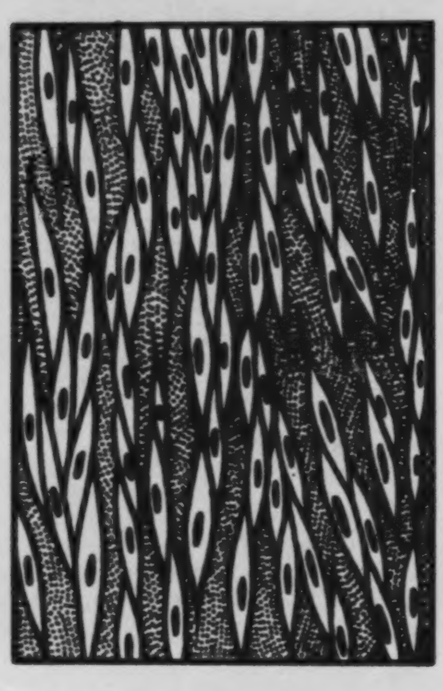

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Figure 3-25.—Smooth Muscle Fibers.

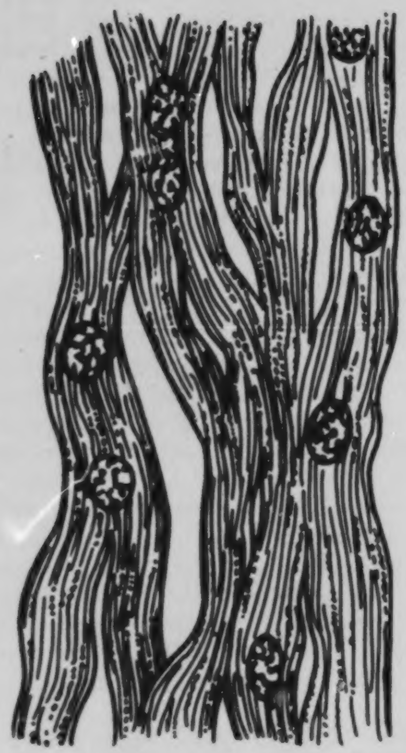

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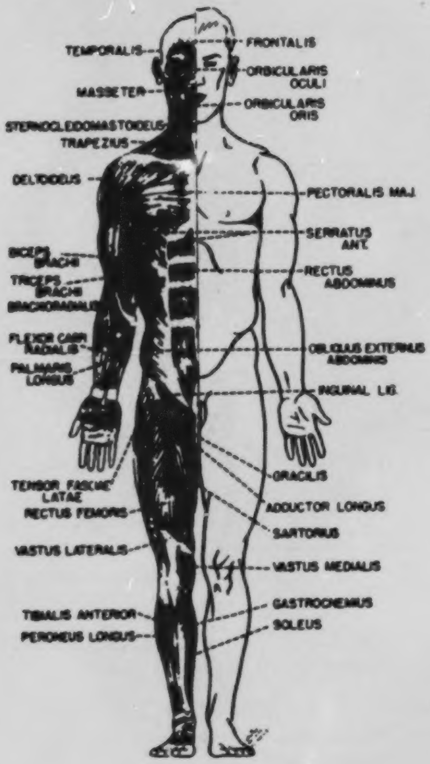
Figure 3-26.—Cardiac Muscle Fibers.


TEMPORALIS
MASSETER
STERNOCLEIDOMASTOIDEUS
TRAPEZIUS
DELTOIDEUS
BICEPS BRACHII
TRICEPS BRACHII
BRACHIORADIALIS
FLEXOR CARPI RADIALIS
PALMARIS LONGUS
TENSOR FASCIAE LATAE
RECTUS FEMORIS
VASTUS LATERALIS
TIBIALIS ANTERIOR
PERONEUS LONGUS
FRONTALIS
ORBICULARIS OCULI
ORBICULARIS ORIS
PECTORALIS MAJ.
SERRATUS ANT.
RECTUS ABDOMINUS
OBLIQUUS EXTERNUS ABDOMINIS
INGUINAL LIG.
GRACILIS
ADDUCTOR LONGUS
SARTORIUS
VASTUS MEDIALIS
GASTROCNEMIUS
SOLEUS

154.100

Figure 3-27.—Important Superficial Muscles, Anterior View.

through the cardiovascular system. Interference with the blood supply to the heart can result in a heart attack.

IMPORTANT FUNCTIONAL MUSCLES

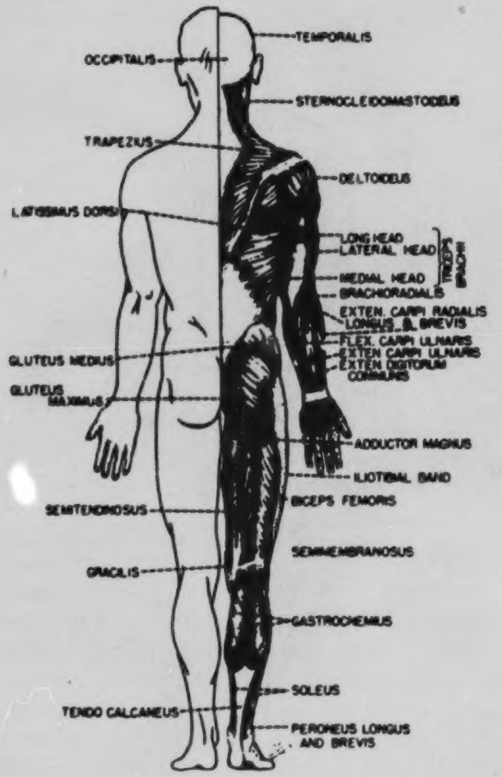
These muscles, shown in figure 3-27 and 3-28, are described below.

The MASSETER muscle raises the mandible, or lower jaw, to close the mouth. It is the chewing muscle in the mastication of food. It originates in the zygomatic process and adjacent parts of the maxilla and is inserted in the mandible.

The TEMPORAL muscle assists the masseter and draws the mandible backward. It has its origin in the temporal fossa and is inserted in the coronoid process of the mandible.

The STERNOCLEIDOMASTOID muscles are located on both sides of the neck. Acting individually, these muscles rotate the head left or right. Acting together, they bend the head forward toward the chest. The sternocleidomastoid muscle originates in the sternum and clavicle and is inserted in the mastoid process of the temporal bone. This muscle is commonly affected in cases of stiff neck.

The TRAPEZIUS muscles are a broad, trapezium-shaped pair of muscles on the upper back, which raise or lower the shoulders. They cover approximately one-third of the back. They originate in a large area, the 12 thoracic vertebrae, the seventh cervical vertebra, and


TEMPORALIS
OCCIPITALIS
STERNOCLEIDOMASTOIDEUS
TRAPEZIUS
DELTOIDEUS
LATISSIMUS DORSI
LONG HEAD
LATERAL HEAD
MEDIAL HEAD
TRICEPS BRACHII
BRACHIORADIALIS
EXTEN. CARPI RADIALIS LONGUS & BREVIS
FLEX. CARPI ULNARIS
EXTEN CARPI ULNARIS
EXTEN DIGITORUM COMMUNIS
GLUTEUS MEDIUS
GLUTEUS MAXIMUS
ADDUCTOR MAGNUS
ILIOTIBIAL BAND
BICEPS FEMORIS
SEMITENDINOSUS
SEMIMEMBRANOSUS
GRACILIS
GASTROCNEMIUS
SOLEUS
TENDO CALCANEUS
PERONEUS LONGUS AND BREVIS

154.101

Figure 3-28.—Important Superficial Muscles, Posterior View.

the occipital bone. They have their insertion in the clavicle and scapula.

The LATISSIMUS DORSI is a broad flat muscle that covers approximately one-third of the back on each side. It rotates the arm inward and draws the arm down and back. It originates from the upper thoracic vertebrae to the sacrum and the posterior portion of the crest of the ilium. Its fibers converge to form a flat tendon that has its insertion in the humerus.

The PECTORALIS MAJOR is the large triangular muscle that forms the prominent chest muscle. It rotates the arm inward, pulls a raised arm down toward the chest, and draws the arm across the chest. It originates in the clavicle, the sternum, the cartilages of the true ribs, and the external oblique muscle. Its insertion is in the greater tubercle of the humerus.

The DIAPHRAGM is an internal muscle that forms the floor of the thoracic cavity and the ceiling of the abdominal cavity. It is the primary muscle of respiration, modifying the size of the thorax and abdomen vertically. It has three openings for the passage of nerves and blood vessels.

The DELTOID muscle raises the arm and has its origin in the clavicle and the spine of the scapula. Its insertion is on the lateral side of the humerus. It fits like a cap over the shoulder and is a frequent site of intramuscular injections.

The BICEPS BRACHII is the prominent muscle on the anterior surface of the upper arm. Its origin is in the outer edge of the glenoid cavity and its insertion in the tuberosity of the radius. This muscle rotates the forearm outward (supination) and, with the aid of the brachial muscle, flexes the forearm at the elbow.

The TRICEPS BRACHII is the primary extensor of the forearm (the antagonist of the biceps brachii). It originates at two points on the humerus and one on the scapula. These three heads join to form the large muscle on the posterior surface of the upper arm. The point of insertion is the olecranon process of the ulna.

The GLUTEALS (MAXIMUS, MINIMUS, and MEDIUS) are the large muscles of the buttocks, which extend and laterally rotate the thigh, as well as abduct and medially rotate it. They arise from the ilium, the posterior surface of the lower sacrum, and the side of the coccyx. Their points of insertion include the greater trochanter and the gluteal tuberosity of the femur. The gluteus maximus is the site of choice for massive intramuscular injections.

The QUADRICEPS is a group of four muscles that make up the anterior portion of the thigh. The rectus femoris originates at the ilium; the vastus femoris, v. lateralis, and v. intermedius originate along the femur. All four are inserted into the tuberosity of the tibia through a tendon passing over the knee joint. The quadriceps serves as a strong extensor of the leg at the knee and flexes the thigh.

The SARTORIUS is the longest muscle in the body. It extends diagonally across the front of the thigh from its origin at the ilium, down to its insertion near the tuberosity of the tibia. Its function is to flex the thigh and rotate it laterally, and to flex the leg and rotate is slightly medially.

The GRACILIS is a long slender muscle located on the inner aspect of the thigh. It adducts the thigh and flexes and medially rotates the leg. Its origin is in the symphysis pubis, and its insertion is in the medial surface of the tibia, below the condyle.

The BICEPS FEMORIS (often called the hamstring muscle) originates at the tuberosity of the ischium and the middle third of the femur. It is inserted on the head of the fibula and the lateral condyle of the tibia. It acts, along with other related muscles, to flex the leg at the knee and to extend the thigh at the hip joint.

The GASTROCNEMIUS and SOLEUS (calf muscles) extend the foot at the ankle. The gastrocnemius originates at two points on the femur; the soleus originates at the head of the fibula and the medial border of the tibia. Both are inserted in a common tendon called the calcaneus, or Achilles tendon.

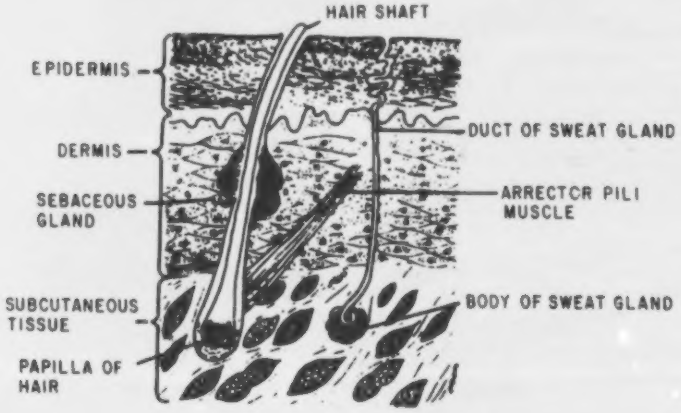
The TIBIALIS ANTERIOR originates at the upper half of the tibia and inserts at the first metatarsal and cuneiform bones. It flexes the foot.

THE INTEGUMENTARY SYSTEM

The skin, or integument, is the outer covering of the body. It consists of two layers, the epidermis and the dermis, and supporting structures and appendages (fig. 3-29).

SKIN FUNCTION

The skin covers almost every visible part of the human body. Even the hair and nails are outgrowths from it. It protects the underlying structures from injury, drying, and invasion by foreign organisms; it contains the peripheral endings of many sensory nerves; and it has limited excretory and absorbing powers. It also plays an important part in regulating body temperature. In addition, the skin is a waterproof covering that prevents excessive water loss, even in very dry climates.



154.102

Figure 3-29.—The Skin.

SKIN STRUCTURE

The EPIDERMIS is the outer skin layer. It is made up of tough, flat, scalelike epithelial cells. Four different sublayers of epidermal cells have been identified. The uppermost is called the horny layer (stratum corneum). It is composed of scaly dead cells that form a protective surface and are gradually sloughed off naturally or by irritation (e.g., sunburn) or abrasion. This scaly layer, if unbroken, can block the passage of almost every known type of germ; however, its protective powers are reduced if the skin is not cleansed regularly. Two middle layers of cells may be present in a particular area of skin, depending on its thickness (the soles of the feet are the thickest, the eyelids the thinnest skin). In the innermost sublayer, the stratum germinativum, new epidermal cells are constantly being produced to replace the sloughed off cells. These newly formed cells push the older cells outward. As they approach the surface, they become drier or more scalelike. Because of this constant activity of the deeper cells of the epidermis, any injury of the outer layer of the skin is repaired in a few days without leaving a scar. Skin pigment, called melanin, which is responsible for skin color, is found here in this deepest sublayer. The color and quantity of the melanin are the chief factors in determing one's complexion. The pigment can be darkened by exposure to the ultraviolet rays of the sun (tanning). Freckles are patches of melanin.

The DERMIS, or true skin, lies below the epidermis and gradually blends into the deeper tissues. It is a wide area of connective tissue that contains blood vessels, hair follicles, nerve endings, smooth muscles, and sweat and oil glands.

The blood vessels of the dermis can dilate to contain a significant portion of the body's blood supply. This ability, along with the actions of the sweat glands, forms the body's primary temperature regulating mechanism. The constriction or dilation of these blood vessels also affects blood pressure and the volume of blood available to the internal organs.

The skin contains nerve endings that carry impulses to and from the central nervous system. The nerves are distributed to the smooth muscles in the walls of the arteries in the dermis and to the smooth muscles around the sweat glands and hair roots. Through these nerves, messages about the external environment are carried to the brain.

Smooth involuntary muscles are found in the dermis. They are responsible for controlling skin surface area. When dilated, these muscles allow for maximum skin surface exposure to aid heat loss. When contracted, the skin surface area is decreased, thus impeding heat radiation. Repeated muscle contractions (shivering) are also a rapid means of generating body heat.

SKIN APPENDAGES

The appendages of the skin are the nails, hairs, sebaceous glands, sweat glands, and ceruminous glands.

The NAILS are composed of horny epidermal scales and are found on the dorsal surfaces of the fingers and toes. They protect the many sensitive nerve endings at the ends of these digits. New formation of nail occurs in the epithelium of the nail bed. As new nail is formed, the whole nail moves forward, becoming longer.

HAIR is an epithelial structure found on almost every part of the surface of the body. Its color depends on the type of melanin present. The hair has two components: the root below the surface and the shaft projecting above the skin. The root is embedded in a pitlike depression called the hair follicle. Hair grows as a result of the division of the cells of the root. A small muscle, the arrector, fastens to the side of the follicle and is responsible for the gooseflesh appearance of the skin as a reaction to cold or fear. Each hair follicle is associated with two or more sebaceous (oil) glands.

SEBACEOUS GLANDS are found in most parts of the skin except in the soles of the feet and palms of the hand. Their ducts open most frequently into the hair follicles and secrete an oily substance that lubricates the skin and hair keeping them soft and pliable and preventing bacterial invasion.

SWEAT GLANDS are found in almost every part of the skin. They are control mechanisms to reduce the body's heat by evaporation of water from its surface. The perspiration secreted is a combination of water, salts, fatty acids, and urea. Normally, about one liter of this fluid is excreted daily. However, the amount varies with atmospheric temperature and humidity and the amount of exercise taken. When the outside temperature is high, or upon exercise, the glands excrete excessive amounts to cool the body through evaporation. When evaporation cannot handle all the sweat that has been excreted, the sweat collects in beads on the surface of the skin.

CERUMINOUS GLANDS are modified sweat glands found only in the auditory canal. They secrete a yellow, waxy substance called cerumen that protects the eardrum.

CIRCULATORY SYSTEM

The circulatory system, also called VASCULAR SYSTEM, consists of the heart, blood vessels, and lymphatic system. It is the primary fuel supplier of the body. The transportation media is the blood. This system is a closed circuit. At no place does it have access to other tissues of the body except at the capillaries.

OSMOSIS, the transfer of fluids through the plasma membrane from an area of lower concentration of particles to an area of higher concentration, is the method of feeding body tissues and eliminating waste materials. This occurs in the capillaries, the smallest of the blood vessels.

BLOOD

Blood is fluid tissue composed of formed elements (cells) suspended in plasma. It is pumped by the heart through miles of arteries, capillaries, and veins to all parts of the body. Total blood volume of the average adult is 5 to 6 liters.

PLASMA is the liquid part of blood; the whole blood minus the cells. Plasma constitutes 50%-60% of whole blood. It is a clear, slightly alkaline, straw-colored liquid consisting of about 92% water. The remainder is made up mainly of proteins. One of these, fibrinogen, contributes to coagulation.

BLOOD SERUM is a clear, pale yellow liquid. It is the liquid portion of blood after coagulation. The main difference between plasma and serum is that plasma is whole blood minus the cells, and serum is blood minus the clotting elements.

Red blood cells (RBCs), or ERYTHROCYTES, are small, biconcave, nonnucleated disks, formed in the red bone marrow. Blood of the average man contains 5 million red cells per cubic millimeter. Women have fewer red cells, 4.5 million per cubic millimeter. Emotional stress, strenuous exercise, high altitudes, and some diseases may cause an increase in the number of RBCs.

During the development of the red blood cells a substance called hemoglobin is combined with it. HEMOGLOBIN is the key of the red cell's ability to carry oxygen and carbon dioxide. Thus the main function of erythrocytes is the transportation of respiratory gases. The red cells deliver oxygen to the body tissues, holding some oxygen in reserve for an emergency. Carbon dioxide is picked up by the same cells and discharged via the lungs.

The color of the red blood cell is determined by the hemoglobin content. Bright red, or arterial, blood is due to the combination of oxygen and hemoglobin. Dark red, or venous, blood is the result of hemoglobin combining with carbon dioxide.

The red blood cell will live only about 100 to 120 days in the body. There are several reasons for its short life span. This delicate cell has to withstand constant knocking around as it is pumped into the arteries by the heart. It travels through blood vessels at high speed, bumps into other cells, bounces off the walls of arteries and veins, and squeezes through narrow passages; it must adjust to continual pressure changes. Fragments of red blood cells are found in the spleen and other body tissues. The spleen is the "graveyard" where old, worn out cells are removed from the blood stream.

White blood cells (WBCs), or LEUKOCYTES, are almost colorless, nucleated cells originating in the bone marrow and in certain lymphoid tissues of the body. There is only one white cell to every 600 red cells. Normal WBC count is 6,000 to 8,000 per cubic millimeter, although the number of white cells may be 15,000 to 20,000 or higher during infection.

Leukocytes are important for the protection of the body against disease. Their movement, called AMEBOID, permits them to leave the blood stream through the capillary wall and to attack pathogenic bacteria. They can travel anywhere in the body and are often named "the wandering cells."

White cells function as regulators. They protect the organism from disease-bearing bacteria by engulfing the foreign body, a process called phagocytosis. When they are undermanned, more are produced, causing an increase in the number of white cells and a condition known as leukocytosis. Another way they protect the body from disease is by the production of bacteriolysins that dissolve the foreign bacteria. The second most important function is that of aiding in blood clotting.

Blood platelets, or THROMBOCYTES, are round bodies in the blood that contain no nucleus, only cytoplasm. They are smaller than red blood cells and average about 250,000 per cubic milliliter of blood. They play an important role in the process of blood coagulation, clumping together in the presence of jagged torn tissue.

BLOOD COAGULATION

To protect the body from excessive blood loss, blood has its own power to coagulate, or clot. If blood constituents and linings of vessels are normal, circulating blood will not clot. Once blood escapes from its vessels, however, a chemical reaction begins that causes it to become solid. The clot formed is at first fluid but soon becomes thick and then sets into a soft jelly that quickly becomes firm enough to act as a plug. This plug is the result of a swift, sure mechanism that changes one of the soluble blood proteins—fibrinogen—into an insoluble protein—fibrin—whenever injury occurs.

Other necessary elements for blood clotting are calcium salts, a substance called prothrombin, which is formed in the liver, blood platelets, and various factors necessary for the completion of the successive steps in the coagulation process. Once the fibrin plug is formed, it quickly enmeshes red and white blood cells and draws them tightly together. Blood serum, a yellowish clear liquid, is squeezed out of the clot as the mass shrinks. Formation of the clot closes the wound, preventing blood loss. A clot also serves as a network for the growth of new tissues in the process of healing.

Normal clotting time is 3 to 5 minutes, but if any of the substances necessary for clotting are absent, severe bleeding will occur.

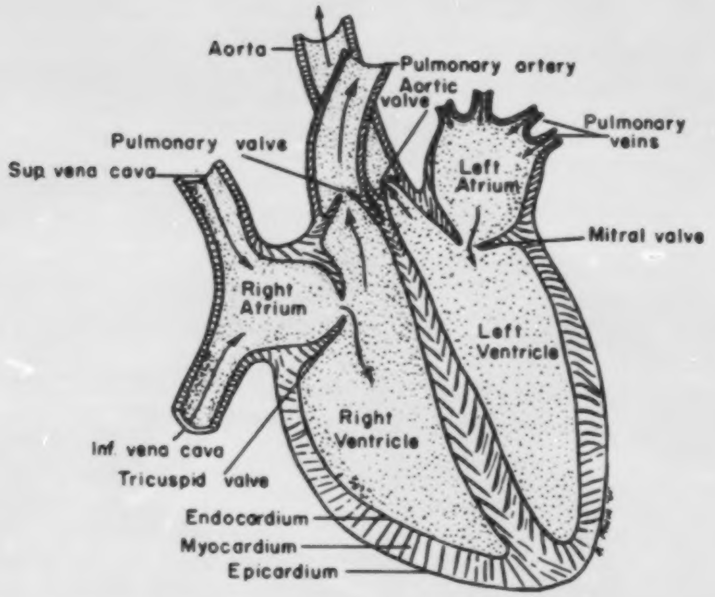
HEMOPHILIA is an inherited disease characterized by delayed clotting of the blood and consequent difficulty in controlling hemorrhage. Hemophiliacs may bleed to death as a result of even a trivial wound.

THE HEART

The heart is a hollow, muscular organ, somewhat larger than the closed fist, located anteriorly in the chest and to the left of the midline. It is shaped like a cone, its base directed upward and to the right, the apex down and to the left. Lying obliquely in the chest, much of the base of the heart is immediately posterior to the sternum.

The heart is enclosed in a membranous sac, the PERICARDIUM. The smooth surfaces of the heart and pericardium are lubricated by a serous secretion, the pericardial fluid. The inner surface of the heart is lined with a delicate serous membrane, the ENDOCARDIUM, similar to and continuous with that of the inner lining of the blood vessels.

The interior of the heart (fig. 3-30) is divided into two parts by a wall called the INTERVENTRICULAR SEPTUM. In each half is an upper chamber, the ATRIUM, which receives blood from the veins, and a lower chamber, the VENTRICLE, which receives blood from the atrium and pumps it out into the arteries. The openings between the chambers on each side of the heart are separated by flaps of tissue that act as valves to prevent backward flow of the continuously forward moving column of blood. The one on the right has three



154.103

Figure 3-30.—Diagram of the Heart.

flaps, or cusps, and is called the TRICUSPID VALVE. The one on the left has two flaps and is called the MITRAL, or BICUSPID, VALVE. The outlets of the ventricles are supplied with similar valves. On the right the pulmonary valve is at the origin of the pulmonary artery, and on the left the aortic valve is at the origin of the aorta.

Physiologically the heart acts as four interrelated pumps. The right atrium receives deoxygenated blood from the body via the superior and inferior venae cavae. It pumps this blood through the tricuspid valve to the right ventricle. The right ventricle pumps the blood past the pulmonary valve through the pulmonary artery to the lungs for oxygenation. The left atrium receives the oxygenated blood from the lungs via four pulmonary veins and pumps it to the left ventricle past the mitral valve. The left ventricle pumps the blood to all areas of the body via the aortic valve and the aorta.

The heart muscle, the MYOCARDIUM, is striated like the skeletal muscles of the body, but involuntary in action, like the smooth muscles. The walls of the atria are thin with relatively little muscle fiber, because the blood flows from the atria to the ventricles under low pressure. However, the walls of the ventricles, which comprise the bulk of the heart, are thick and muscular. The wall of the left ventricle is considerably thicker than that of the right, because more force is required to pump the blood into the peripheral systemic circulation than into the lungs located only a short distance from the heart.

The heart acts by contraction and relaxation. It contracts with a wringing motion, forcing the blood into the arteries. Each contraction is followed by limited relaxation or dilation. Cardiac muscle never completely relaxes, it always maintains a degree of tone. Contraction of the heart is SYSTOLE and the period of work. Relaxation of the heart with limited dilation is DIASTOLE and the period of rest. A complete CARDIAC CYCLE is the time from the onset of one contraction, or heart beat, to the onset of the next.

The contractions of the heart are stimulated and maintained by the SINOATRIAL NODE, commonly called the PACEMAKER of the heart, which is a group of hundreds of cells in the upper part of the right atrium that sets off electrical impulses causing both atria to contract simultaneiously. The normal heart rate, or number of contractions, is about 72 beats per minute.

The BLOOD PRESSURE is the pressure the blood exerts on the walls of the arteries. The highest pressure is called SYSTOLIC pressure, because it is caused when the heart is in systole, or contraction. A certain amount of blood pressure is maintained in the arteries even when the heart is relaxed. This is the DIASTOLIC pressure, because it is present during diastole, or relaxation of the heart.

Normal blood pressure can vary considerably with age, weight, and general condition of the individual. For young adults the systolic pressure is between 120 and 150 mm of mercury, and the diastolic pressure is between 70 and 90 mm of mercury. Women have a lower blood pressure than men. The difference between systolic and diastolic pressure is known as PULSE PRESSURE.

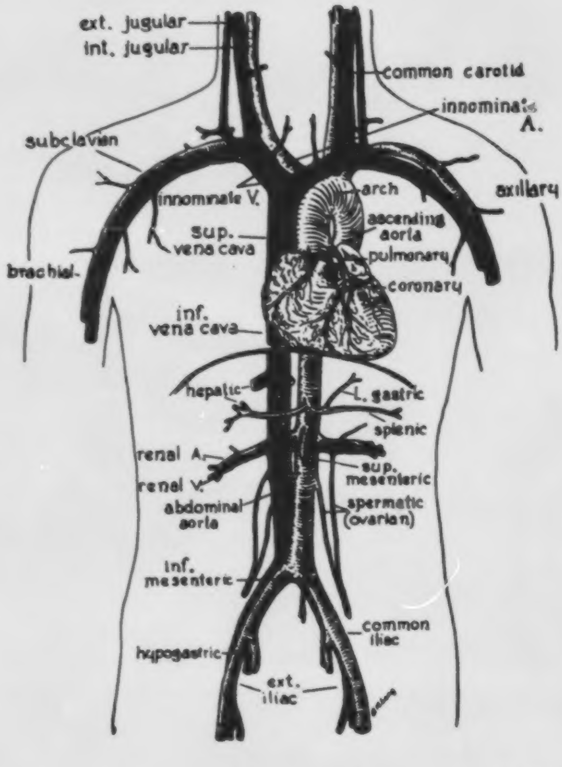
BLOOD VESSELS

The blood vessels of the body fall into three distinct classifications:

1. Distributors—arteries and arterioles
2. Exchangers—capillaries
3. Collectors—veins and venules

The ARTERIES are elastic tubes constructed to withstand high pressure. They carry blood from the heart to all parts of the body. The smallest branches of the arteries are called arterioles.

The AORTA is the large tubelike structure arising from the left ventricle of the heart. It arches upward over the left lung and then down along the spinal column through the thorax and the abdomen, where it divides to send arteries down both legs (fig. 3-31). The CORONARY ARTERIES are branches of what is generally called the ascending aorta, and they supply the heart with blood.


ext. jugular
int. jugular
common carotid
innominate A.
subclavian
axillary
innominate V.
arch
sup. vena cava
ascending aorta
pulmonary
brachial
coronary
inf. vena cava
hepatic
L. gastric
splenic
renal A.
renal V.
sup. mesenteric
abdominal aorta
spermatic (ovarian)
inf. mesenteric
common iliac
hypogastric
ext. iliac

154.104

Figure 3-31.—Arteries and Veins of the Torso.

There are certain branches of the aorta with which you should be familiar, since these often must be compressed to control hemorrhage. You will find a discussion of the pressure points in the hemorrhage section of the First Aid and Emergency Procedures chapter.

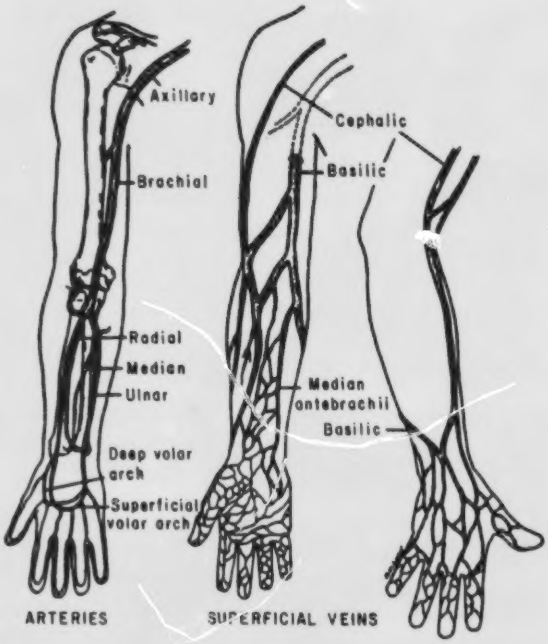
Three large arteries arise from the aorta as it arches over the left lung. First, the innominate artery, which divides into the right subclavian artery to supply the right arm, and the right common carotid to supply the right side of the head. The second branch is the left common carotid, which supplies the left side of the head. The third branch from the arch of the aorta is the left subclavian, which supplies the left arm.

The carotids divide into internal and external branches, the external supplying the muscle and skin of the face; the internal supplying the brain and the eyes.

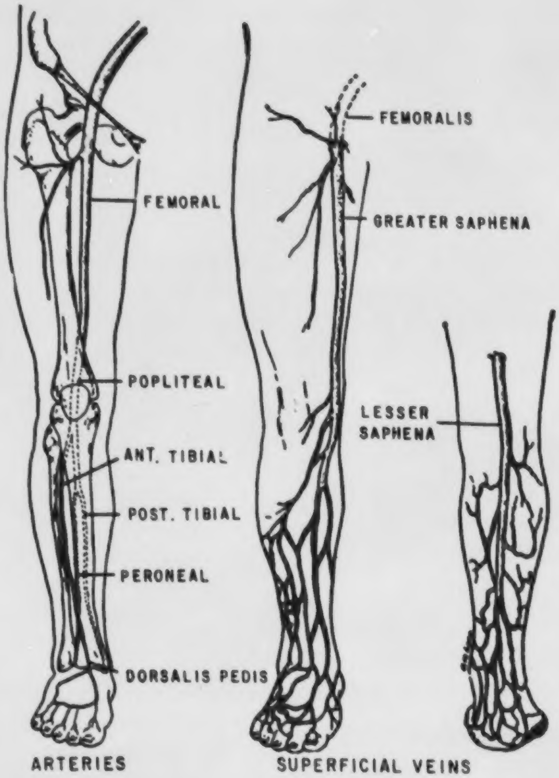
The subclavian arteries are so named because they run underneath the clavicle. They supply the upper extremity, branching off to the back, chest, neck, and brain via the spinal column (fig. 3-31).

The large artery going to the arm is called the axillary. It divides into the ulnar and radial arteries. The radial artery is the one at the wrist which you feel to take the pulse of your patient. It is located on the thumb side (fig. 3-32).

In the abdomen the aorta gives off branches to the abdominal viscera, including the stomach, liver, spleen, kidneys, and intestines. It finally divides into the left and right common iliacs, which supply the lower extremities. On entering the thigh, this artery is called the femoral artery. At the knee it becomes the popliteal (fig. 3-33).


Axillary
Brachial
Radial
Median
Ulnar
Deep volar arch
Superficial volar arch
Cephalic
Basilic
Median antebrachii
Basilic
ARTERIES
SUPERFICIAL VEINS

154.105
Figure 3-32.—Arteries and Veins of the Upper Extremity.


FEMORAL
POPLITEAL
ANT. TIBIAL
POST. TIBIAL
PERONEAL
DORSALIS PEDIS
FEMORALIS
GREATER SAPHENA
LESSER SAPHENA
ARTERIES
SUPERFICIAL VEINS

154.106
Figure 3-33.—Arteries and Veins of the Lower Extremity.

At the end of the arterioles is a system of minute vessels that vary in structure, but which are spoken of collectively as CAPILLARIES. It is from these capillaries that the tissues of the body are fed. There are approximately 60,000 miles of capillaries in the body. As the blood passes through the capillaries it releases oxygen and nutritive substances to the tissues and takes up various waste products to be carried away by the veins.

VEINS comprise a system of vessels that collect blood from the capillaries and carry it back to the heart. Veins begin as tiny venules formed from the capillaries. Joining together as tiny rivulets, they connect and form a small stream. The force of muscles contracting adjacent to veins aids in the forward propulsion of blood on its return to the heart. Valves, spaced frequently along the larger veins, prevent the backflow of blood.

BLOOD COLLECTION SYSTEMS (Venous Circulation)

Since arterial blood arises at the heart, we trace arteries from the heart. To return blood to the heart, we trace veins from the small venules back through larger veins. There are three principle venous systems in the body: the pulmonary, portal, and systemic.

The PULMONARY SYSTEM comprises four vessels, two from each lung, which empty into the left atrium. These are the only veins in the body that carry freshly oxygenated blood.

The PORTAL SYSTEM consists of the veins that drain venous blood from the abdominal part of the digestive tract (except the lower rectum), spleen, pancreas, and gallbladder, and deliver it to the liver. There it is distributed by a set of venous capillaries. The blood in the portal system conveys absorbed substances from the intestinal tract to the liver for storage, alteration, or detoxification. From the liver the blood flows through the hepatic vein to the inferior vena cava.

The SYSTEMIC SYSTEM is divided into deep and superficial veins. The superficial veins lie immediately under the skin, draining the skin and superficial structures. The deep veins, usually located in the muscle or deeper layers, drain the large muscle masses and various other organs. They usually lie close to the large arteries that supply the various organs of the body (fig. 3-31), and usually have the same name as the artery they accompany.

The superficial veins of the head unite to form the external jugular veins. They drain blood from the scalp, face, and neck, and finally empty into the subclavian veins.

The veins draining the brain and internal facial structures are the internal jugular veins. These combine with the subclavian veins to form the innominate veins, which empty into the superior vena cava (fig. 3-31).

The veins of the upper extremity begin at the hand and extend upward. An extremely valuable vein, the median cubital, crosses the anterior surface of the elbow. It is the vein most commonly used for intravenous injections and infusions.

The deep veins of the upper arm unite to form the axillary vein, which unites with the superficial veins to form the subclavian vein. This later unites with other veins to form the innominate and eventually, after union with still more veins, the superior vena cava.

In the lower extremity (fig. 3-32) a similar system drains the superficial areas. The great saphenous vein originates on the inner aspect of the foot and extends up the inside of the leg and thigh to join the femoral vein in the upper thigh. This vein is sometimes used for intravenous injections at the ankle. The superficial venous system of the leg often becomes varicose, or excessively dilated, particularly in persons whose occupations require long periods of standing. When this develops, the venous valves become incompetent, allowing stagnation of blood in the dependent extremity. Under these circumstances varicose ulcers frequently develop. Ligation at several points along the system will force the venous return into the deep venous system and restore normal venous circulation.

The veins from the lower extremities unite to form the femoral vein in the thigh, which becomes the external iliac vein in the groin. Higher in this region, it unites with the hypogastric vein from the lower pelvic region to form the common iliac vein. The two common iliac veins unite to form the inferior vena cava.

The veins from the abdominal organs, with the exception of those of the portal system, empty directly or indirectly into the inferior vena cava, while those of the thoracic region eventually empty into the superior vena cava.

LYMPHATIC SYSTEM

LYMPH

All tissue cells of the body are continuously bathed in interstitial fluid. This fluid is formed by leakage of blood plasma through minute pores of the capillaries. There is a continual interchange of fluids of the blood and tissue spaces with a free interchange of nutrients and other dissolved substances. Most of the tissue fluid returns to the circulation by means of venous capillaries, which feed into the larger veins. Large protein molecules that have escaped from the arterial capillaries cannot reenter the circulation through the small pores of the venous capillaries. However, these large molecules, as well as white blood cells, dead cells, bacterial debris, infected substances, and larger particulate matter, can pass through the larger pores of the lymphatic capillaries and thus enter the lymphatic circulation with the remainder of the tissue fluid.

Lymph usually is clear, but following ingestion of a fatty meal the lymph contained in the lymphatics that drain the small intestines appears milky because of the fat globules that have been absorbed. This milky lymph is call CHYLE.

LYMPH VESSELS

Lymph vessels and lymph nodes form a network throughout the body. Capillaries, like veins, collect lymph from the tissue spaces and, by means of a system in which small vessels unite to form larger ones, carry it toward the heart. As the lymph vessels increase in size, the walls become stronger until they are composed of three layers, like blood vessels. Along the path of the larger lymphatics are valves that prevent backflow of lymph.

Lymphatic channels from the upper half of the right side of the body converge to form the right lymphatic duct, which empties into the right subclavian vein. Drainage from the remainder of the body is by way of the thoracic duct, which empties into the left subclavian vein.

LYMPH NODES

Lymph nodes, which are frequently called glands but are not true glands, are small, bean-shaped bodies of lymphatic tissue found in groups of two to fifteen along the course of the lymph vessels. Just beneath the skin they usually occur singly. Nodes vary in size and act as filters to remove bacteria and particles from the lymph stream. Lymph nodes also participate in the manufacture of white blood cells and thus in the immunity functions of the body.

THE RESPIRATORY SYSTEM

Respiration (breathing) is the exchange of oxygen and carbon dioxide between the atmosphere and the cells of the body. There are two phases of respiration:

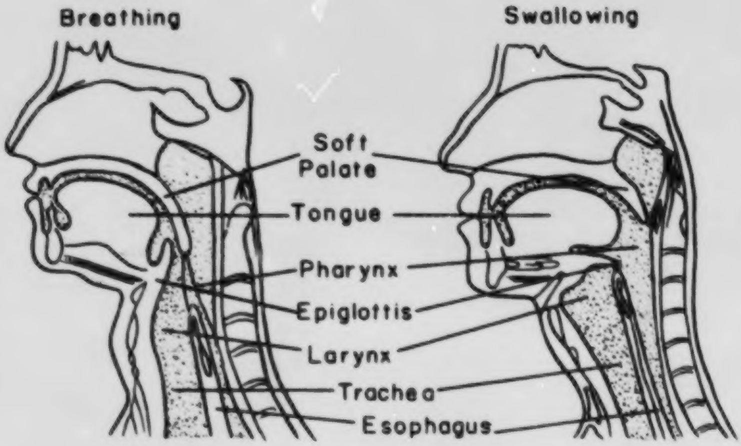
- Physical, or mechanical, respiration involves the motion of the diaphragm and rib cage. The musculoskeletal action, which resembles that of a bellows, causes air to be inhaled or exhaled.

- Physiological respiration involves an exchange of gases, oxygen and carbon dioxide, at two points in the body. The first is the transfer that occurs in the lungs between the incoming oxygen and the carbon dioxide present in the capillaries of the lungs (external respiration). The second transfer occurs when the oxygen brought into the body replaces the carbon dioxide built up in the cellular tissue (internal respiration).

Normally, oxygen and carbon dioxide exchange in equal volumes; however, certain physiological conditions may throw this balance off. For example, heavy smokers will find that the ability of their lungs to exchange gases is impaired, leading to shortness of breath and fatigue during even slight physical exertion. This is the direct result of their inability to draw a sufficient amount of oxygen into the body to replace the carbon dioxide buildup and sustain further muscular exertion. On the other side, hyperventilation brings too much oxygen into the body, overloading the system with oxygen and depleting the carbon dioxide needed for balance.

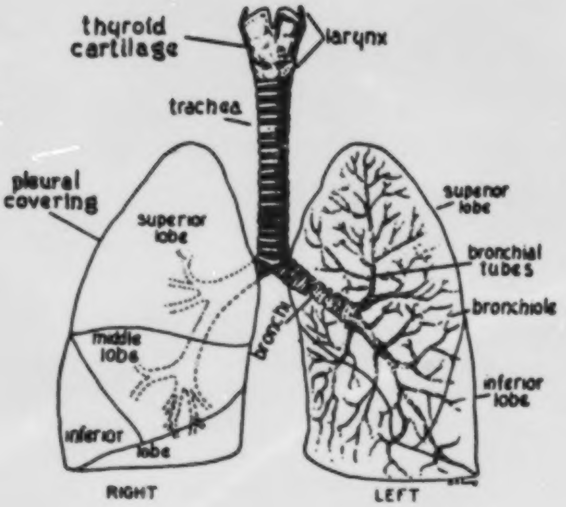
ANATOMY OF THE RESPIRATORY SYSTEM

Air enters the nasal chambers and the mouth, then passes through the pharynx, larynx, trachea, and bronchi into the bronchioles, which form a network around the alveolar air sacs in the lungs (fig. 3-34 and 3-35).


Breathing
Swallowing
Soft Palate
Tongue
Pharynx
Epiglottis
Larynx
Trachea
Esophagus

154.107

Figure 3-34.—Commonalities of the Upper Respiratory and Digestive Sytstems.


thyroid cartilage
larynx
trachea
pleural covering
superior lobe
middle lobe
inferior lobe
bronchi
superior lobe
bronchial tubes
bronchiole
inferior lobe
RIGHT
LEFT

154.108

Figure 3-35.—The Lungs and the Air Passage.

The air enters the NASAL CAVITY through the nostrils (NARES). Lining the nasal passages are hairs, which, together with the mucous membrane, entrap and filter out dust and other minute particles that could irritate the lungs. Incoming air is warmed and moistened in the chambers of the nasal cavity to prevent damage to the lungs.

The mouth and nose serve as auxiliary respiratory structures.

The PHARYNX, or throat, serves both the respiratory and digestive systems and aids in speech. It has a mucous membrane lining that traps microscopic particles in the air and aids in adjusting temperature and humidifying inspired air. The pharynx connects with the mouth and nasal chambers posteriorly. According to its location it is referred to as:

NASOPHARYNX—posterior to the nasal chambers

OROPHARYNX—posterior to the mouth

LARYNGOPHARYNX—posterior to the larynx

The EPIGLOTTIS is a lidlike, cartilaginous structure that covers the entrance to the larynx and separates it from the pharynx. It acts as a trap door to deflect food particles and liquids from the entrance to the larynx and trachea.

The LARYNX, or voice box, is a triangular cartilaginous structure located between the tongue and the trachea. It is protected anteriorly by the thyroid cartilage (Adam's apple), which is usually larger and more prominent in men than in women. During the act of swallowing, it is pulled upward and forward toward the base of the tongue. The larynx is responsible for the production of voice. This is accomplished by the passing of air over the vocal cords. The ensuing vibrations can be controlled to produce the sounds of speech or singing. The nose, mouth, throat, bone sinuses, and chest serve as resonating chambers to further refine and individualize the voice.

The TRACHEA, or windpipe, begins at the lower end of the larynx and terminates by dividing into the right and left bronchi. It is a long, cylindrical tube composed of 16 to 20 C-shaped cartilaginous rings, embedded in a fibrous membrane, that support its walls, preventing their collapse (fig. 3-35).

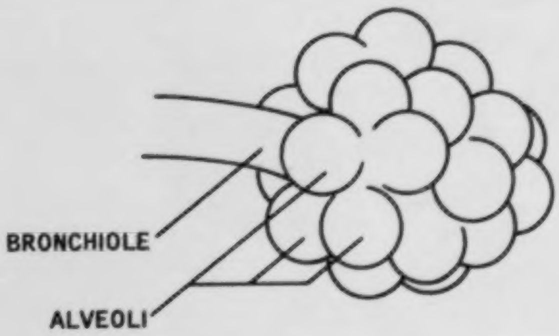
The trachea has a ciliated mucous membrane lining that entraps dust and foreign material. It also propels secretions and exudates from the lungs to the pharynx, where they can be expectorated.

The BRONCHI are the terminal branches of the trachea, which carry air to each lung and further divide into the bronchioles (fig. 3-35).

The BRONCHIOLES are much smaller than the bronchi and lack supporting rings of cartilage. They terminate at the alveoli (fig.3-36).

The ALVEOLI are thin, microscopic air sacs within the lungs. They are in direct contact with the pulmonary capillaries. It is here that fresh oxygen exchanges with carbon dioxide by means of a diffusion process through the alveolar and capillary cell walls (fig. 3-37).

The LUNGS are cone-shape organs that lie in the thoracic cavity. Each lung contains thousands of alveoli with their capillaries. The right lung is larger than the left and is divided into superior, middle, and inferior lobes. The left lung has two lobes, the superior and inferior.



154.109

Figure 3-36.—Bronchiole and Alveoli.

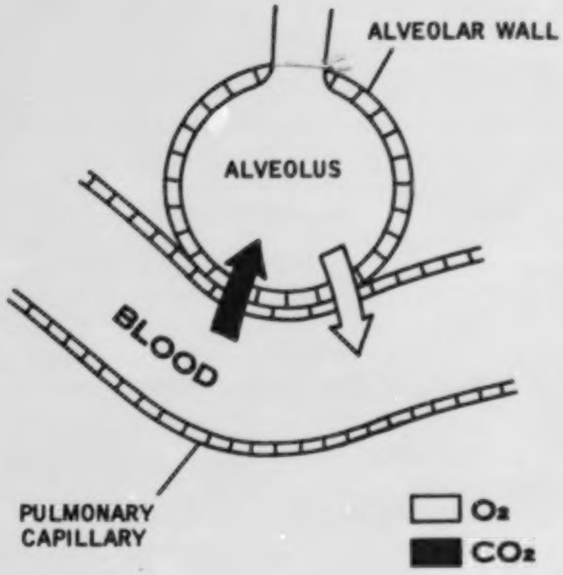


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Figure 3-37.—Pulmonary Exchange at Alveoli.

The PLEURAE are airtight membranes that cover the outer surface of the lungs and line the chest wall. They secrete a serous fluid that prevents friction during movements of respiration. Pleurisy is a painful inflammation of the pleural lining.

The MEDIASTINUM is the interpleural space between the two lungs. It extends from the sternum to the thoracic vertebrae and from the fascia of the neck to the diaphragm. It contains the heart, the great blood vessels, the esophagus, a portion of the trachea, and the primary bronchi.

The DIAPHRAGM is the primary muscle of respiration. It is dome-shaped and separates the thoracic and abdominal cavities. Contraction of the muscle flattens the dome and expands the vertical diameter of the chest cavity.

The INTERCOSTAL MUSCLES are situated between the ribs. Their contraction pulls the ribs upward and outward, resulting in an increase in the transverse diameter of the chest (chest expansion).

INHALATION is the direct result of the expansion caused by the action of the diaphragm and intercostal muscles. The increase in chest volume creates a negative (below atmospheric) pressure in the pleural cavity and lungs. Air rushes into the lungs through the mouth and nose to equalize the pressure. EXHALATION results when the muscles of respiration relax. Pressure is exerted inwardly as muscles and bones return to their normal position, forcing air from the lungs.

THE PROCESS OF RESPIRATION

The rhythmical movements of breathing are controlled by the respiratory center in the brain. Nerves from the brain pass down through the neck to the chest wall and diaphragm. The nerve to the diaphragm is called the phrenic nerve; the nerve to the larynx is the vagus nerve; and those to the muscles between the ribs are the intercostobrachial nerves.

The respiratory center is stimulated by chemical changes in the blood, especially if it becomes acidic. When too much carbon dioxide accumulates in the blood stream, the respiratory center signals the lungs to breathe faster to get rid of the carbon dioxide.

The respiratory center can also be stimulated or depressed by signals from the brain. For example, changes in one's emotional state can alter respiration through laughter, crying, emotional shock, or panic.

The muscles of respiration normally act automatically, with normal respiration being 14 to 18 cycles per minute. The lungs, when filled to capacity, hold about 6,500 ml of air, but only 500 ml of air is exchanged with each normal respiration. This exchanged air is called TIDAL AIR. The amount of air left in the lungs after forceful exhalation is about 1,200 ml and is known as RESIDUAL AIR. The existence of this reserve is the basis for administering the abdominal thrust maneuver, described in the First Aid and Emergency Procedures chapter of this manual. In this life-saving procedure the residual air is used to force a foreign object out of the trachea.

ABNORMALITIES OF BREATHING

The following terms are used to describe breathing and significant variations in exchanges of respiratory gases:

EUPNEA—Ordinary quiet respiration.

BRADYPNEA—Abnormal slowness of breathing.

TACHYPNEA—Excessive rapidity of respiration.

HYPOPNEA—Abnormal decrease in the depth and rate of the respiratory movements.

DYSPNEA—Labored or difficult breathing.

HYPERPNEA—Abnormal increase in the depth and rate of the respiratory movements.

APNEA—Cessation of breathing.

CHEYNE-STOKES RESPIRATION—The respirations increase with force and frequency up to a certain point, then decrease until they cease altogether. After a short period of apnea, the respirations begin again, and the cycle is repeated.

STERTOROUS RESPIRATION—Breathing with abnormal snoring sounds.

RALES—Abnormal respiratory sounds, either moist or dry depending upon the fluid in the air passages, which are classified according to their location as bronchial or laryngeal rales.

RHONCHUS—A rattling sound in the throat due to partial obstruction; also a dry, coarse rale in the bronchial tubes.

THE NERVOUS SYSTEM

To effectively support human life, the activities of all the widely diverse cells, tissues, and organs of the body must be monitored, regulated, and coordinated. The interaction of the nervous and endocrine systems provides the needed control.

The nervous sytem is specifically adapted to the rapid transmission of impulses from one area of the body to another. On the other hand, the endocrine system, working at a far slower pace, maintains body metabolism at a fairly constant level.

In this section we will study the structure and functions of the nervous system.

THE NEURON

The structural and functional unit of the nervous system is the nerve cell, or neuron, which can be classified into three types. The first is the sensory neuron, which conveys sensory impulses inward from the receptors. The second is the motor neuron, which carries command impulses from a central area to the responding muscles or organs. The third type is the interneuron, which links the sensory neurons to the motor neurons.

The neuron is composed of dendrites, a cyton, and an axon (fig. 3-38). The DENDRITES are thin receptive branches, which vary greatly in size, shape, and number with different types of neurons. They serve as receptors, conveying impulses toward the cyton. The CYTON is the cell body containing the nucleus. The single, thin extension of the cell outward from the cyton is called the AXON. It conducts impulses away from the cyton to its terminal filaments, which transmit the impulses to the dendrites of the next neuron.

IMPULSE TRANSMISSION

When dendrites receive a sufficiently strong stimulus, a short and rapid depolorization of the neuron is triggered. Sodium ions rush through the plasma membrane into the cell, potassium ions leave, and an electrical impulse is formed,

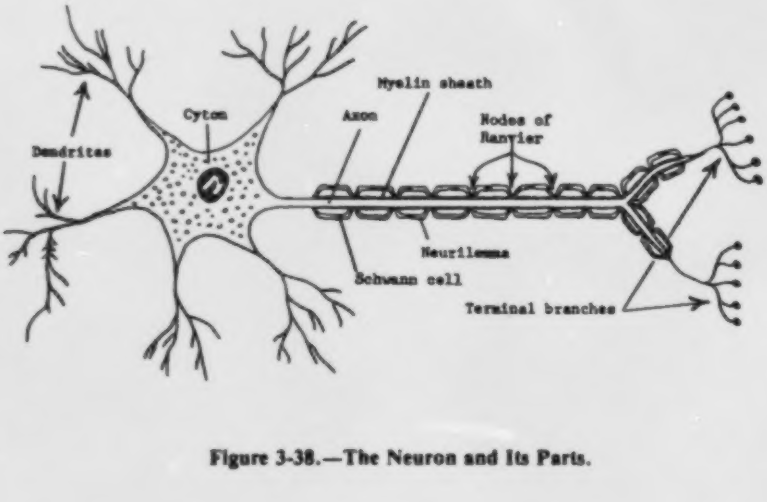

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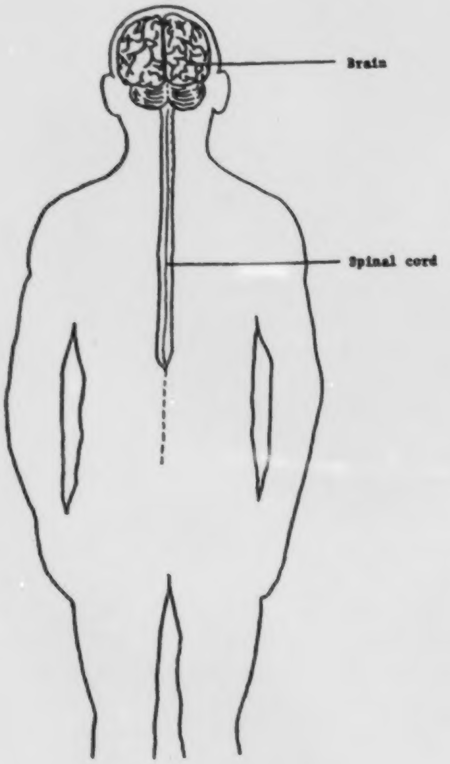
Figure 3-38.—The Neuron and Its Parts.



154.112
Figure 3-39.—The Central Nervous System.

which is conducted toward the cyton. The cyton receives the impulse and transmits it to the terminal filaments of the axon. At this point a chemical transmitter such as acetylcholine is released into the SYNAPSE, a space between the axon of the activated nerve and the dendrite receptors of another neuron. This transmitter activates the next nerve. In this manner the impulse is passed from neuron to neuron down the nerve line to a central area at approximately the speed of a bullet.

Almost immediately after being activated, the transmitter chemical in the synapse is neutralized by the enzyme acetylcholinesterase, and the first neuron returns to its normal state by pumping out the sodium ions and drawing potassium ions back in through the plasma membrane. When these actions are completed, the nerve is ready to be triggered again. A particularly strong stimulus will cause the nerve to fire in rapid succession, or will trigger many other neurons, thus giving a feeling of intensity to the perceived sensation.

CENTRAL NERVOUS SYSTEM

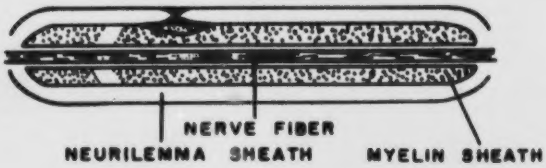
The central nervous system consists of the brain and spinal cord (fig. 3-39). The brain is almost entirely enclosed in the skull, but it is connected with the spinal cord, which lies in the canal formed by the vertebral column.

Brain

The brain has two main divisions, the cerebrum and the cerebellum.

The cerebrum is the largest and most superiorly situated portion of the brain. It occupies most of the cranial cavity. The outer surface is called the cortex. This portion of the brain is also called gray matter because the nerve fibers are unmyelinated (not covered by a myelin sheath), causing them to appear gray. Beneath this layer is the medulla. This is often called the white matter of the brain, because the nerves are myelinated (covered with a myelin sheath and an outer covering called the neurilemma), which gives them their white appearance (fig. 3-40).

The cortex of the cerebrum is irregular. It bends on itself in folds called convolutions, which are separated from each other by grooves and fissures. The deep sagittal cleft, a



154.113
Figure 3-40.—Sheath of a Neuron.

longitudinal fissure, divides the cerebrum into two hemispheres. Other fissures further subdivide the cerebrum into lobes, each of which serves a localized, specific brain function (fig. 3-41). For example, the frontal lobe is associated with the higher mental processes such as memory, the parietal lobe is concerned primarily with general sensations, the occipital lobe is related to the sense of sight, and the temporal lobe is concerned with hearing.

The cerebellum is situated posterior to the brain stem, which is made up of the pons, midbrain, and medulla oblongata, and inferior to the occipital lobe. It is concerned chiefly with bringing balance, harmony, and coordination to the motions initiated by the cerebrum.

Two small divisions of the brain, vital to life, are the pons and the medulla oblongata.

The pons consists chiefly of a mass of white fibers connecting the other three parts of the brain—the cerebrum, cerebellum, and medulla oblongata.

The medulla oblongata is the inferior portion of the brain, the last division before the beginning of the spinal cord. It connects to the spinal cord at the upper level of the first cervical vertebra (C-1). In it are the centers for the control of heart action, breathing, circulation, and other vital processes such as blood pressure.

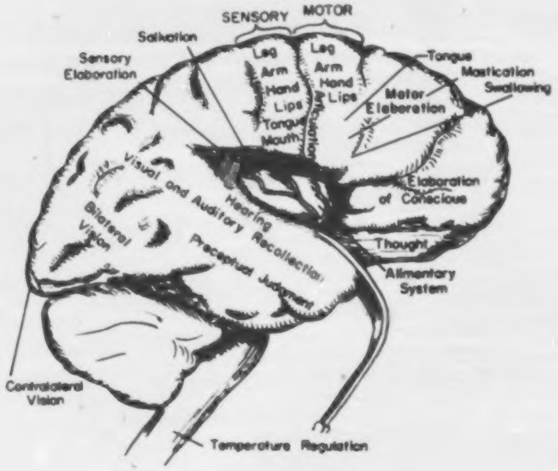


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Figure 3-41.—Functional Areas of the Brain.

The outer surface of the brain and spinal cord is covered with three layers of membrane called the meninges. The dura mater is the strong outer layer; the arachnoid membrane is the delicate middle layer; and the pia mater is the vascular innermost layer that adheres to the surface of the brain and spinal cord. Inflammation of the meninges is called meningitis. The type depends upon whether the brain, spinal cord, or both are affected.

Cerebrospinal fluid is formed by a plexus (network) of blood vessels in the central ventricles of the brain. It is a clear, watery solution similar to blood plasma. The total quantity bathing the spinal cord is about 75 ml. It is constantly being produced and reabsorbed. It circulates over the surface of the brain and spinal cord and serves as a protective cushion as well as a means of exchange for food and waste materials.

The Spinal Cord

The spinal cord is continuous with the medulla oblongata and extends from the foramen magnum, down inside the atlas, to the lower border of the first lumbar vertebra, where it tapers to a point. The cord is surrounded by the bony walls of the vertebral canal. It is ensheathed in the three protective meninges and surrounded by adipose tissue and blood vessels. The cord does not completely fill the vertebral canal, nor does it extend the full length of it. The nerve roots serving the lumbar and sacral regions must pass some distance down the canal before making their exit.

A cross section of the spinal cord shows white and gray matter (fig. 3-42). The outer white matter is composed of bundles of myelinated nerve fibers arranged in functionally specialized tracts. It establishes motor communication between the brain and the body parts. The inner gray unmyelinated matter is

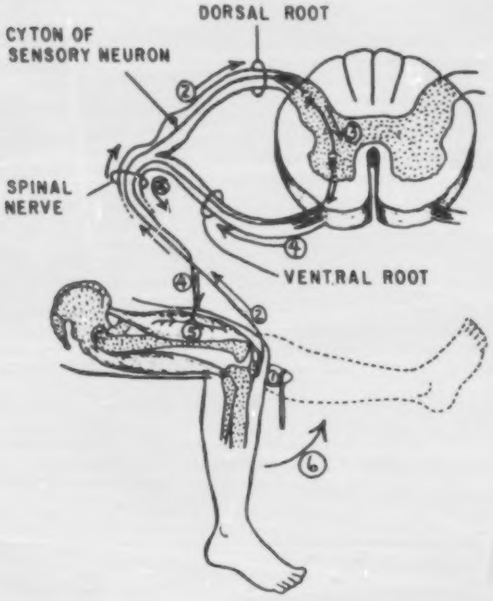


DIAGRAM SHOWING SEQUENCE OF A TYPICAL REFLEX ARC. (1) PATELLAR TENDON IS STRUCK WITH HAMMER. (2) SENSORY IMPULSE TRAVELS ALONG NEURON FROM STRETCH RECEPTORS IN TENDON TO SPINAL CORD. (3) IN SPINAL CORD, INTERNUNCIAL NEURON SYNAPSES WITH SENSORY AND MOTOR NEURONS. (4) MOTOR IMPULSE LEAVES SPINAL CORD VIA VENTRAL ROOT OF SPINAL NERVE AND TRAVELS TOWARD MUSCLE. (5) MUSCLE IS STIMULATED TO CONTRACT, PRODUCING (6) KNEE JERK REFLEX.

154.115

Figure 3-42.—Cross Section of the Spinal Cord and Reflex Arc.

shaped roughly like the letter H. It establishes sensory communication between the brain and the spinal nerves, conducting sensory impulses from the body parts. It also plays an integral role in the autonomic nervous system and in the reflex arc, both of which will be discussed later.

Spinal Cord Function

The spinal cord may be thought of as an electrical cable containing many wires (nerves) that connect parts of the body with each other and with the brain. Sensations received by a sensory nerve are brought to the spinal cord, and the impulse is transferred either to the brain or to a motor nerve. The majority of impulses go to the brain for action. However, a system exists for quickly handling emergency situations. It is called the reflex arc.

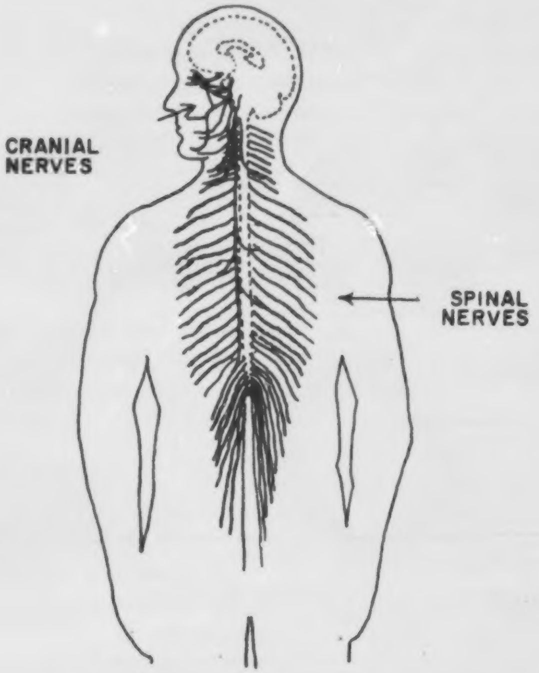
If you touch a hot stove, you must remove the hand from the heat source immediately or the skin will burn very quickly. But the passage of a sense impulse to the brain and back again to a motor nerve takes time. The reflex arc is set up to respond instantaneously to emergency situations like the one just described. The sensation of hot travels to the spinal cord on a sensory nerve, where it is picked up by an interneuron in the gray matter, which triggers the appropriate motor nerve to stimulate a muscle reflex drawing the hand away. Another example of the reflex arc is shown in figure 3-42.

The reflex arc works well in simple situations requiring no action of the brain. Consider, however, what action is involved if the individual touching the stove pulls back and, in so doing, loses his or her balance and has to grab a chair to regain stability. Then the entire spinal cord is involved. Additional impulses must travel to the brian, then down to the muscles of the legs and arms to enable him or her to maintain balance and to hold on to a steadying object. While all this is going on, the stimulus is relayed via the sympathetic autonomic nerve fibers to the adrenal glands, causing adrenalin to flow, which stimulates heart action, and to the brain, making the individual conscious of pain.

In this example the spinal cord has functioned not only as a center for spinal reflexes, but also as a conduction pathway for other areas of the spinal cord to the autonomic nervous system and to the brain.

PERIPHERAL NERVOUS SYSTEM

The peripheral nervous system is made up of 12 pairs of cranial nerves and 31 pairs of spinal nerves arising from the brain and spinal cord, respectively. These nerves carry both voluntary and involuntary impulses (fig. 3-43).



154.116
Figure 3-43.—The Peripheral Nervous System.

Cranial Nerves

The 12 pairs of cranial nerves are sensory, motor or mixed (sensory and motor).

- The OLFACTORY nerve (sensory) conveys the sense of smell from the mucous membrane in the upper nose to the olfactory center of the brain.

- The OPTIC nerve (sensory) conveys the sensation of sight from the retinal cells of the eye to the visual area of the brain.

- The OCULOMOTOR nerve (motor) controls most muscles that move the eyeball and some of those in the iris of the eye.

- The TROCHLEAR nerve (motor) controls the muscles that turn the eyeball down and to the side.

- The TRIGEMINAL nerve (sensory, some motor) is divided into three branches: ophthalmic, maxillary, and mandibular. It sometimes is called the great sensory nerve of the head because it supplies the sense of touch, pain, heat, and cold to the skin of the face, eyelids, cornea, conjunctiva, tongue, teeth, and mucous membranes of the head. A branch of the mandibular division supplies motor fibers to the muscles of mastication.

- The ABDUCENS nerve (motor) controls the muscle that turns the eye outward.

- The FACIAL nerve (motor and sensory) controls the muscles of the face, scalp, and ears. It contains autonomic motor fibers, which cause the salivary glands to secrete, and sensory fibers, which carry taste sensation from the anterior two-thirds of the tongue to the brain.

- The ACOUSTIC (vestibulocochlear) nerve (sensory) is the nerve of hearing and equilibrium.

- The GLOSSOPHARYNGEAL nerve (motor and sensory) carries sensations from the pharynx and posterior one-third of the tongue and transmits motor impulses to the parotid gland and to one of the small muscles of swallowing.

- The VAGUS nerve (motor, some sensory) is composed of motor fibers (some of which are parasympathetic) and sensory fibers. It extends down through the neck to the pharynx, larynx, trachea, esophagus, and thoracic and abdominal viscera.

- The ACCESSORY nerve (motor) supplies nerves to muscles of the neck (sternocleidomastoid, trapezius, pharyngeal, and laryngeal).

- The HYPOGLOSSAL nerve (motor) controls the muscles of the tongue.

Spinal Nerves

Spinal nerves arise from the spinal cord and leave the vertebral canal in the spaces between the vertebrae. These nerves send fibers to sensory surfaces and all muscles of the trunk and extremities. Also, involuntary fibers go to the smooth muscles and glands of the gastrointestinal tract, urogential system, and cardiovascular system. There are 31 pairs of spinal nerves: 8 cervical, 12 thoracic, 5 lumbar, 5 sacral, and 1 coccygeal. The lower spinal nerves going to the legs and feet extend below the level of the spinal cord. The nerve roots arising from the lumbar and sacral regions pass some distance down the canal before making their exit. This bundle of nerve roots is called the cauda equina because it resembles a horse's tail. The various roots emerge through openings in the sacrum and extend to the areas they supply.

Spinal nerves contain all types of sensory and motor fibers of both the voluntary and autonomic nervous systems. In some regions of the body they interlace in a thick network called a plexus. The cervical plexus is located in the neck, and the brachial plexus is in the shoulder. In the pelvic region are the lumbar, sacral, and pudendal plexuses.

AUTONOMIC NERVOUS SYSTEM

The autonomic nervous system, as its name implies, functions automatically. It helps to regulate the smooth muscles, cardiac muscle, digestive tube, blood vessels, sweat and digestive glands, and certain endocrine glands. It is not directly under the control of the brain but usually works in harmony with the nerves that are under the brain's control. The autonomic nervous system is divided into the sympathetic and parasympathetic systems (see table 3-1).

SYMPATHETIC NERVOUS SYSTEM

Numerous ganglia (nerve centers) located just outside the spinal cord, beside the vertebrae, are the basis of the sympathetic (thoracolumbar) system. These nerve centers connect with the thoracic and lumbar regions of the spinal cord and, through the spinal nerves, with the muscles, organs, and glands they affect.

Because one function of the sympathetic system is to increase the activity of the body to enable it to meet danger or undergo strenuous physical activity, it has been called the "fight or flight" nervous system. The sympathetic nerves, when stimulated, usually discharge as a unit, and the effects can be noticed especially under circumstances of fright or rage; for example, the heart beats faster, blood pressure rises, the spleen discharges red blood cells into the blood, the blood sugar level rises, the pupils dilate, and the peripheral blood vessels constrict. These changes prepare the body for a stressful situation.

PARASYMPATHETIC SYSTEM

The ganglia of the parasympathetic system are located in the midportion of the brain, the medulla oblongata, and the sacral regions. For this reason the parasympathetic system is sometimes called the craniosacral system. The ganglia in the midbrain and medulla oblongata send impulses out along cranial nerves (oculomotor, facial, glossopharyngeal, and vagus). The sacral ganglia stem from the second, third, and fourth sacral nerves.

The parasympathetic nerves do not all discharge at once. They aim more toward conserving and restoring energy. Their actions slow the heart beat, lower the blood pressure, stimulate gastrointestinal movements and secretions, aid absorption, contract the pupils, dilate peripheral blood vessesls, and empty the bladder and rectum. Overall they promote the autonomic restoration of body systems to normal functioning after sympathetic stimulation.

The sympathetic and parasympathetic systems counterbalance each other to preserve a harmonious balance of body functions and activities.

THE SENSORY SYSTEM

The sensory system functions to inform areas of the cerebral cortex of changes that are taking place within the body or in the external environment. The special sensory receptors are designed to respond only to a special individual stimulus such as sound waves, light, taste, smell,

Table 3-1.—Functions of the Autonomic Nervous System

Sympathetic	Parasympathetic
● Dilates pupils.	● Contracts pupils.
● Lessens tonus of ciliary muscles so the eyes may accommodate to see distant objects.	● Contracts ciliary muscles so the eyes may accommodate to see objects near at hand.
● Dilates bronchi.	● Constricts bronchi.
● Quickens and strengthens the action of the heart.	● Slows the action of the heart.
● Contracts blood vessels of the skin and viscera so that more blood goes to the skeletal and cardiac muscles where it is needed for "fight or flight."	● Dilates blood vessels (except cardiac).
● Relaxes gastrointestinal tract and bladder.	● Increases contractions of gastrointestinal tract and muscle tone of the bladder.
● Decreases secretions of gastrointestinal glands.	● Increases secretions of gastrointestinal glands.
● No action on sweat glands.	● Increases secretion of sweat glands.
● Causes contraction of sphincters to prevent empyting of bowels or bladder.	● Relaxes sphincters so that waste matter can be excreted.

pressure, heat, cold, pain, or touch. Position changes, balance, hunger, and thirst sensations are also detected and passed on to the brain.

SMELL

Odor is perceived upon stimulation of the receptor cells in the olfactory membrane of the nose. The olfactory receptors are very sensitive; but they are also easily fatigued. This explains why odors that are initially very noticeable are not sensed after a short time. Smell is not as well developed in man as in other mammals.

TASTE

The taste buds are located in the tongue. The sensation of taste is limited to sour, sweet, bitter, and salty. Many foods and drinks tasted are actually smelled, and their taste depends upon their odor. This can be demonstrated by pinching the nose shut when eating onions. Sight can also affect taste. Several drops of green food coloring in a glass of milk will make it all but unpalatable, even though the true taste has not been affected.

SIGHT

The eye, the organ of sight, is a specialized structure for the reception of light. It is assisted in its function by accessory structures such as the ocular muscles, eyelids, conjunctiva, and lacrimal apparatus.

Structure of The Eye

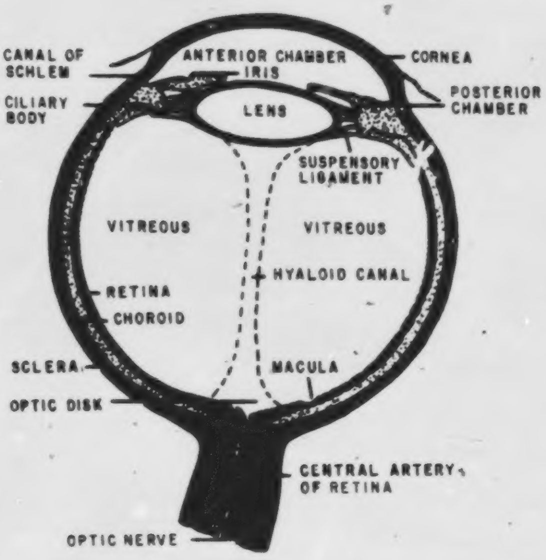
The eye is a hollow ball, or globe, which consists of various tissues that perform specific functions. The globe, or eyeball, is composed of three layers (fig. 3-44).

Outer Layer. The outer layer of the eye is called the sclera. It is the tough, fibrous, protective portion of the globe, commonly called the white of the eye. Anteriorly, the outer layer is transparent and is called the cornea or the window of the eye. It permits light to enter the globe. The exposed sclera is covered with a mucous membrane, the conjunctiva, which is a continuation of the inner lining of the eyelids. The lacrimal gland produces tears that constantly wash the front part of the eye and the conjunctiva. The tear gland secretions that do not evaporate flow toward the inner angle of the eye where they drain down ducts into the nose.

Middle Layer. The middle layer of the eye is called the choroid. It is a highly vascular, pigmented tissue that provides nourishment to the inner structures. Continuous with the choroid is the ciliary body, whose muscular structure attaches to the lens by means of suspensory ligaments and produces changes in the thickness of the lens. This permits the eye to focus to long-range or close-up vision.

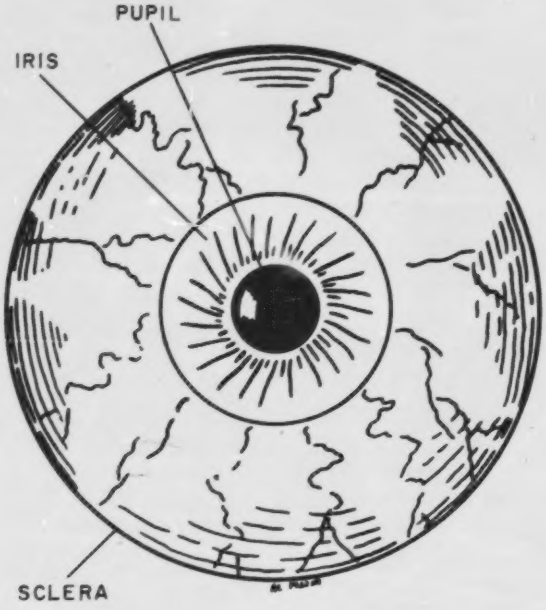
The iris is continuous with the ciliary body. It is a circular, pigmented muscular structure that gives color to the eye. The opening in the iris is called the pupil (fig. 3-45). The amount of light entering the pupil is regulated through the constriction of radial/circular muscles in the iris. When strong light is flashed into the eye, the circular muscle fibers of the iris contract, reducing the size of the pupil. If the light is dim, the pupil dilates to allow as much of the light in as possible. The size and reactions of the pupils of the eyes are an important diagnostic tool.

The lens is a transparent, biconvex structure suspended directly behind the iris. It separates the interior eye into anterior and posterior


CANAL OF SCHLEM
ANTERIOR CHAMBER
IRIS
CORNEA
CILIARY BODY
LENS
POSTERIOR CHAMBER
SUSPENSORY LIGAMENT
VITREOUS
VITREOUS
HYALOID CANAL
RETINA
CHOROID
SCLERA
MACULA
OPTIC DISK
CENTRAL ARTERY OF RETINA
OPTIC NERVE

154.117

Figure 3-44.—Cross Section of the Eye.

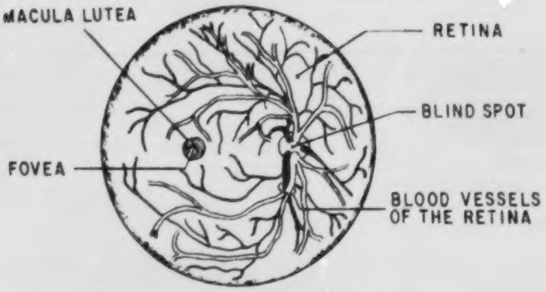

PUPIL
IRIS
SCLERA

154.118

Figure 3-45.—Eye, Anterior View.

cavities. The anterior cavity contains a watery solution called aqueous humor, which helps to give the cornea its curved shape. The optic globe posterior to the lens is filled with a jellylike substance called vitreous humor, which helps to maintain the shape of the eyeball and prevents misshaping by maintaining intraocular pressure.

Inner Layer. The inner layer of the eye is called the retina (fig. 3-46). It contains different layers of nerve cells, and rods and cones that are the receptors of the sense of vision. The retina is continuous with the optic nerve, which enters the back of the globe and carries visual impulses received by the rods and cones to the brain. The area where the optic nerve enters the eyeball contains no rods and cones and is called the blind spot.



INTERIOR OF RIGHT EYE AS SEEN THROUGH AN OPHTHALMOSCOPE

NEAR THE CENTER OF THE RETINA SHOWN IS A SMALL DEPRESSION, THE FOVEA, WHERE THE CONES ARE MOST DENSELY CONCENTRATED. THE FOVEA IS THE POINT OF BEST FOCUS AND BEST COLOR VISION IN THE EYE. THE FOVEA IS LOCATED IN THE CENTER OF A YELLOWISH AREA KNOWN AS THE MACULA LUTEA. THE MACULA LUTEA ALSO CONTAINS ONLY CONES. THE RODS INCREASE IN DENSITY TOWARD THE PERIPHERY OF THE RETINA *.

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* THIS EXPLAINS WHY, IN A DARK ROOM OR ON A DARK NIGHT, YOU CANNOT SEE AN OBJECT BY LOOKING DIRECTLY AT IT. CONES ARE ONLY STIMULATED BY HIGHER INTENSITIES OF LIGHT; THEY ARE NOT STIMULATED BY LIGHT REFLECTED FROM AN OBJECT IN DIM LIGHT. RODS, HOWEVER, CAN BE STIMULATED BY LOWER INTENSITIES OF LIGHT, SO THAT YOU ARE ABLE TO SEE THE OBJECT BEST BY LOOKING TO ONE SIDE OR THE OTHER OF IT AND ALLOWING THE LIGHT TO STRIKE THE RODS AROUND THE PERIPHERAL AREAS OF THE RETINA RATHER THAN THE CONES IN THE CENTRAL AREA.

154.119

Figure 3-46.—Eye, Opthalmoscope View.

The rods respond to low intensities of light and are responsible for night vision. They are located in all areas of the retina, except in the small depression called fovea centralis, where light entering the eye is focused, and which has the clearest vision.

The cones require higher light intensities for stimulation and are most densely concentrated in the fovea centralis. The cones are responsible for daytime vision.

Vision Process

Deflection or bending of light rays results when light passes through substances of varying densities in the eye (cornea, aqueous humor, crystalline lens, and vitreous humor) (fig. 3-47). The deflection is referred to as refraction. Accommodation is the process performed by the lens that increases or decreases its curvature to refract light rays into focus on the fovea.

The constriction of the pupil by the iris regulates the amount of light entering the eye. This process protects the retina from excessive stimulation and prevents a scattering of light rays that would produce blurred vision.

A movement of the globes toward the midline, which causes a viewed object to come into focus on corresponding points of the two retinas, is called convergence. This gives clear, three-dimensional vision.

The end receptors or nerve endings in the rods and cones that have been stimulated by light conduct impulses to the occipital lobes of the cerebrum, where they are interpreted into vision (fig. 3-47).

HEARING

The ear is the primary organ of hearing. It is divided into three parts: the external, middle, and inner ear (figs. 3-48 and 3-49).

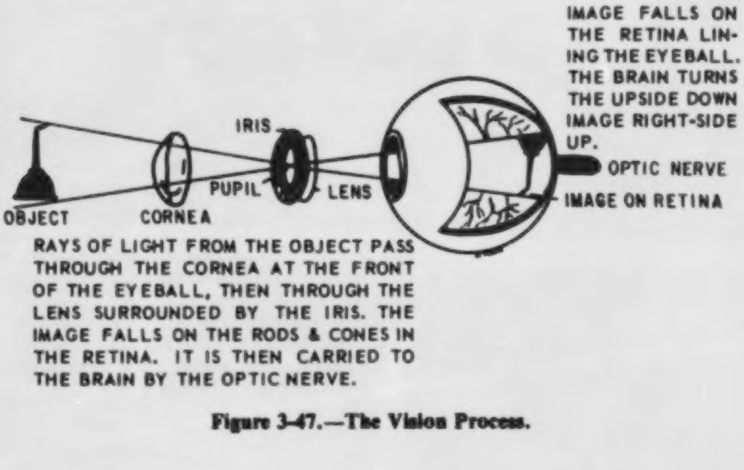


IMAGE FALLS ON THE RETINA LINING THE EYEBALL. THE BRAIN TURNS THE UPSIDE DOWN IMAGE RIGHT-SIDE UP.
IRIS
OPTIC NERVE
PUPIL
LENS
IMAGE ON RETINA
OBJECT
CORNEA
RAYS OF LIGHT FROM THE OBJECT PASS THROUGH THE CORNEA AT THE FRONT OF THE EYEBALL, THEN THROUGH THE LENS SURROUNDED BY THE IRIS. THE IMAGE FALLS ON THE RODS & CONES IN THE RETINA. IT IS THEN CARRIED TO THE BRAIN BY THE OPTIC NERVE.

Figure 3-47.—The Vision Process. 154.120

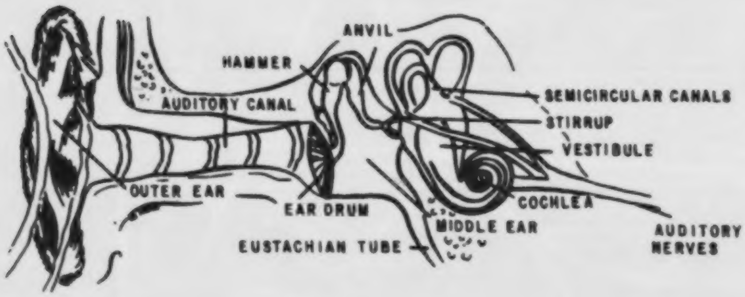

ANVIL
HAMMER
AUDITORY CANAL
SEMICIRCULAR CANALS
STIRRUP
VESTIBULE
OUTER EAR
EAR DRUM
COCHLEA
MIDDLE EAR
AUDITORY NERVES
EUSTACHIAN TUBE

Figure 3-48.—The Ear. 154.121

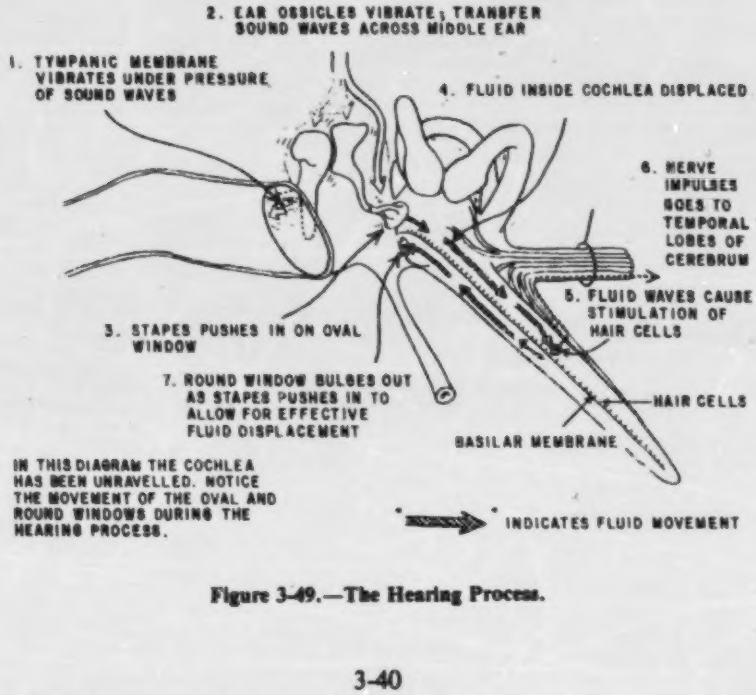

2. EAR OSSICLES VIBRATE; TRANSFER SOUND WAVES ACROSS MIDDLE EAR
1. TYMPANIC MEMBRANE VIBRATES UNDER PRESSURE OF SOUND WAVES
4. FLUID INSIDE COCHLEA DISPLACED
6. NERVE IMPULSES GOES TO TEMPORAL LOBES OF CEREBRUM
5. FLUID WAVES CAUSE STIMULATION OF HAIR CELLS
3. STAPES PUSHES IN ON OVAL WINDOW
7. ROUND WINDOW BULGES OUT AS STAPES PUSHES IN TO ALLOW FOR EFFECTIVE FLUID DISPLACEMENT
HAIR CELLS
BASILAR MEMBRANE
IN THIS DIAGRAM THE COCHLEA HAS BEEN UNRAVELLED. NOTICE THE MOVEMENT OF THE OVAL AND ROUND WINDOWS DURING THE HEARING PROCESS.
INDICATES FLUID MOVEMENT

Figure 3-49.—The Hearing Process. 154.122

External Ear. The external, or outer, ear is composed of two parts, the auricle and the external auditory canal. The auricle, or pinna, is a cartilaginous structure located on each side of the head. The auricle collects sound waves from the environment, which are then conducted by the external auditory canal to the eardrum. The lining of the auditory canal contains glands that secrete a waxy substance called cerumen. The cerumen aids in protecting the eardrum against foreign bodies and microorganisms.

The eardrum, or tympanic membrane, is an oval sheet of fibrous epithelial tissue, 10 mm by 9 mm in size, which stretches across the inner end of the external auditory canal and separates the outer and middle ear. The sound waves cause the eardrum to vibrate. This vibration transfers the sounds from the external environment to the auditory ossicles.

Middle Ear. The middle ear is a cavity in the temporal bone, lined with epithelium. It contains three auditory ossicles—the malleus (hammer), the incus (anvil), and the stapes (stirrup)—which transmit vibrations from the tympanic membrane to the fluid in the inner ear. The malleus is attached to the inner surface of the eardrum and connects with the incus, which in turn connects with the stapes. The base of the stapes is attached to the oval window (fenestra ovalis), the membrane-covered opening of the inner ear. These tiny bones link together to span the middle ear. They are suspended from its bony wall by ligaments and provide the mechanical means for transmission of sound vibrations to the inner ear.

The eustachian tube connects the middle ear with the pharynx. It is lined with a mucous membrane and is about 36 mm long. Its function is to equalize internal and external air pressure. For example, while riding an elevator in a tall building, you may experience a feeling of pressure in the ear. This is usually relieved by swallowing, which opens the eustachian tube and allows the pressurized air to escape and equalize with the area of lower pressure. Divers who ascend too fast to allow pressure to adjust may experience rupture of their eardrums. The eustachian tube can also be a pathway for infection of the middle ear.

Inner Ear. The inner ear is filled with a fluid called endolymph. Sound vibrations that cause the stapes to move against the oval window create internal ripples that run through the endolymph. These pressurized ripples move to the cochlea, a small, snail-shaped structure housing the organ of Corti, the hearing organ. The cells protruding from the organ of Corti are stimulated by the ripples to convert these mechanical vibrations into nerve impulses, which are relayed via the cochlear (8th cranial) nerve to the auditory area of the cortex in the temporal lobe of the brain. Here they are interpreted as the sounds we hear.

Other structures of the inner ear are the three semicircular canals, situated perpendicular to each other. Movement of the endolymph within the canals, caused by general body movements, stimulates nerve endings, which report these changes in body position to the brain, which in turn uses the information to maintain equilibrium.

The round window (fenestra rotunda) is another membrane-covered opening of the inner ear. It contracts the middle ear and flexes to accommodate the inner ear ripples caused by the stapes.

TOUCH

Until the beginning of the last century, touch (feeling) was treated as a single sense. Thus warmth or coldness, pressure, and pain, were thought to be part of a single sense of touch or feeling. It was then discovered that different types of nerve ending receptors are widely, but unevenly, distributed in the skin and mucous membranes. For example, the skin of the back possesses relatively few touch and pressure receptors while the fingertips have a great many. The skin of the face has relatively few cold receptors, and the mucous membranes have few heat receptors. The cornea of the eye is sensitive to pain, and when pain sensation is abolished by a local anesthetic, a sensation of touch can be experienced.

There are five kinds of receptors. The most important, those for the sense of touch, are bare nerve endings next to hairs, and specialized encapsulated nerve endings called Meissner's corpuscles. Cold receptors also have encapsulated nerve endings.

The receptors for pain are naked nerve filaments and are the most numerous; they are also the only kind present in the deeper tissues, although stimulation of these usually causes the pain to be referred to a skin area. Three kinds of pain may be experienced: superficial or cutaneous pain; deep pain from muscles, tendons, joints, and fascia; and visceral pain.

OTHER SENSES

Certain nerve receptors, located in muscles and tendons, are stimulated by changes in tension and pressure and continually inform the brain regarding the position of parts of the body (body sense).

Hunger results from rhythmic contractions of the stomach when it has emptied its contents. Blood sugar levels also influence the feeling of hunger. Habit is another factor; for example, persons who habitually snack in midmorning will feel hunger contractions at normal snacktime. If the snack is not eaten for several days, and adequate food intake continues at mealtime, the hunger contractions at snacktime will diminish. The nervous system also plays a part in controlling hunger, either by depressing the desire for food or by stimulating appetite.

The drying of the membranes in the oral cavity influences the sensation of thirst. Although thirst may be due to a lack of water in body tissues, a reduced salivary flow can produce sensation of thirst.

SPECIAL FUNCTIONS

SPEECH is controlled by the coordinated action of several nerve functions. The speech center is located deep in the brain, and from it nerve impulses pass out to the larnyx, which contains folds of mucous membranes called vocal cords. When air is forced from the lungs past these folds, certain sounds are produced, and, in conjunction with the movements of the throat, lips, tongue, and teeth, articulate speech results.

SLEEP is a period of unconsciousness when the higher physical powers are quiet, although body activities continue. It is usually considered a period of rest in which constructive processes build up and repair the body. Certain changes take place during sleep: respiration is slowed; less blood is sent to the brain and greater amounts go to the extremities; digestion goes on, but at a slower rate; body temperature may drop somewhat; and heart action is slowed.

THE ENDOCRINE SYSTEM

Homeostasis depends on the nervous and endocrine systems, since both are lines of communication for body functions. The endocrine system sends messages by chemical hormones that are carried in the blood stream. These messages aid in the control, development, and integration of body functions.

The endocrine system is made up of glands of internal secretion. These are called ductless glands because they have no ducts to carry away their secretions. The secretion of an endocrine gland is called a hormone. It enters directly into the blood or lymph circulation and eventually reaches the gland, tissue, or organ it controls or influences. Very small quantities of hormones are produced, since only a trace amount is needed to produce the desired effect.

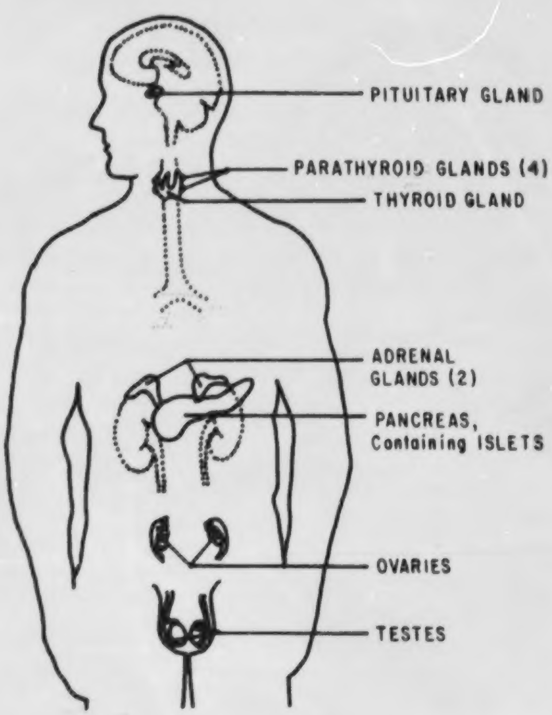
Most hormones can be extracted from the glands of animals, and some can be produced synthetically. Medical officers may prescribe these isolated or synthetic hormones for patients who are deficient in them or who might otherwise benefit from their use. The hormone-producing glands include the pituitary, thyroid, parathyroids, adrenals, gonads, and pancreas (fig. 3-50).

HYPOTHALAMUS

The hypothalamus, a structure in the brain, synthesizes chemicals that are secreted to the pituitary gland to stimulate the release of its hormones.

PITUITARY GLAND

The pituitary is a small, pea-sized gland located at the base of the brain in the sella



154.123

Figure 3-50.—The Endocrine Glands.

turcica of the sphenoid bone. It is often called the master gland of the body, because it influences most other endocrine glands. It is divided into two lobes, an anterior and a posterior.

The anterior lobe plays the more important role in influencing body functions. The hormones it produces have a broad and significant range of effects.

SOMATOTROPIN, the growth hormone, influences body growth and development. During the growth years an overproduction of somatotropin causes giantism while the lack of it cause dwarfism. An overproduction after the growth years causes acromegaly, which is characterized by the development of abnormally large hands, feet, and jaw.

THYROTROPIN, or the thyroid-stimulating hormone (TSH), influences the growth, development, and secreting activities of the thyroid gland.

GONADOTROPIN influences the gonads (ovaries or testes) and is essential for the normal development and functioning of both male and female reproductive systems.

The ADRENOCORTICOTROPIC hormone (ACTH) acts primarily on the adrenal cortex, stimulating its growth and its secretion of corticosteroids. Removal of the pituitary leads to rapid atrophy of the adrenal cortex.

The posterior lobe of the pituitary produces at least two hormones, vasopressin and oxytocin. VASOPRESSIN acts as an antidiuretic hormone (ADH), promoting the conservation of water by the kidney. When ADH is not produced in adequate amounts, the daily urine volume is between 10 and 15 liters instead of the normal 1.5 liters. This condition is known as diabetes insipidus.

OXYTOCIN stimulates contraction of the muscles of the uterus, particularly during pregnancy. It also plays an important role in the production of milk in the mammary glands of nursing mothers.

THYROID GLAND

The thyroid, shaped like a butterfly, lies in the anterior part of the neck, below the larynx. It consists of two lobes, one on each side of the upper trachea, connected by a strip of tissue called the isthmus. The thyroid secretes the iodine-containing hormone THYROXIN, which controls the rate of cell metabolism. Excessive secretion of thyroxin raises the metabolic rate and causes hyperthyroidism, a condition characterized by a fast pulse rate, dizziness, increased basal metabolism, profuse sweating, tremors, nervousness, and a tremendous appetitie yet a loss of weight. The thyroid may become enlarged.

Iodine is essential for the formation of thyroxin. To prevent simple goiter, iodine-containing foods such as vegetables, iodized salt, and sea food are eaten.

Hypothyroidism, on the other hand, is caused by an insufficient secretion of thyroxin. The patient exhibits a decrease in basal metabolism, and sweating is almost absent. There may be a weight gain and constant fatigue. The heart rate may be slow, and there may be an enlargement of the gland, called a simple goiter. There may also be personality changes characterized by slow, lethargic mental functioning. Hypothyroidism in an infant may result in cretinism with impaired mental/physical development.

PARATHYROID GLANDS

Parathyroid glands are four small round bodies located just posterior to the thyroid gland. Their hormone, PARATHORMONE, regulates the calcium and phosphorus content of the blood and bones. The amount of calcium is important in certain tissue activities such as bone formation, coagulation of blood, maintenance of normal muscular excitability, and milk production in the nursing mother. Diminished function or removal of the parathyroid glands results in a low calcium level in the blood, and in extreme cases death may occur, preceded by strong contractions of the muscles (tetany) and convulsions.

Hyperparathyroidism, an excess of parathyroid hormone in the blood, causes calcium levels in the blood to become elevated by the withdrawal of calcium from the bones, leaving the skeleton demineralized and subject to spontaneous fractures. The excess calcium may be deposited as stones in the kidneys.

ADRENAL GLANDS

The adrenal glands are located on the superior surface of each kidney, fitting like a cap. They consist of an outer portion, the cortex, and an inner portion, the medulla.

Adrenal Cortex. Specialized cells in the outer layer of the adrenal cortex produce three types of steroid hormones that are of vital importance.

MINERALOCORTICOIDS are regulators of fluid and electrolyte balance. They are sometimes called salt and water hormones because they regulate the excretion and absorption of sodium chloride, potassium, and water.

GLUCOCORTICOIDS are essential to metabolism. They increase certain liver functions and have an anti-inflammatory effect. Clinically they are used to suppress inflammatory reactions, to promote healing, and to treat rheumatoid arthritis.

The adrenal cortex also produces sex hormones, some with male characteristics (ANDROGENS), others with female characteristics (ESTROGENS). These hormones appear in different concentrations in both men and women.

Adrenal Medulla. The adrenal medulla secretes EPINEPHRINE (ADRENALIN) in the presence of emotional crises, hypoglycemia (low blood sugar), or low blood pressure. Epinephrine constricts the peripheral vascular system and dilates the blood vessels to the skeletal muscles. Heart rate, respiration rate and depth, blood pressure, blood sugar levels, and metabolism are all increased by epinephrine. It also stimulates the production of other adrenal cortical hormones.

NOREPINEPHRINE is also produced in the adrenal medulla. It is a chemical precursor to epinephrine. Its effects are similar to those of epinephrine, but its action differs.

Despite these marked influences, the medullary tissue of the adrenal gland is not essential to life, because its various functions can be assumed by other regulatory mechanisms.

GONADS

The male gonads secrete the hormone TESTOSTERONE, which influences the development and maintenance of the accessory organs and the secondary sex characteristics of the male.

The female gonads, the OVARIES, produce ESTROGEN and PROGESTERONE. Estrogen influences the development and maintenance of the female accessory organs and the secondary sex characteristics and promotes changes in the mucous lining of the uterus (endometrium) during the menstrual cycle. Progesterone prepares the uterus for the reception and development of the fertilized ovum and maintains the lining during pregnancy. It is used in many birth control pills.

PANCREAS

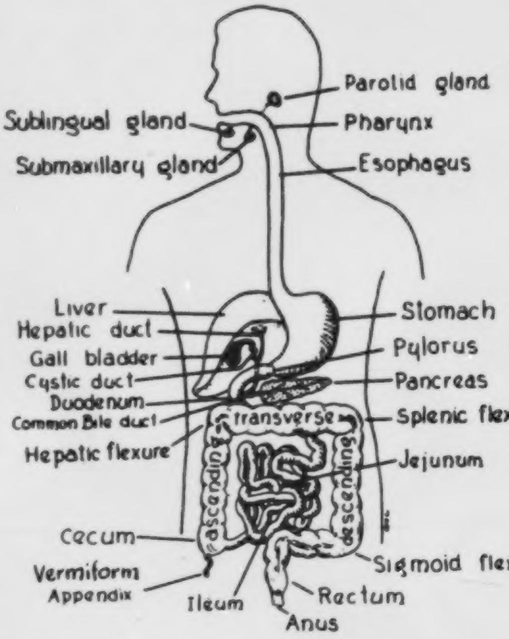
The islands of Langerhans in the pancreas contain two types of endocrine cells, alpha and beta. The alpha cells secrete glucagon, which causes a temporary rise in blood sugar levels. The beta cells secrete insulin, which is essential for carbohydrate metabolism. Insulin lowers blood sugar levels by increasing tissue utilization of glucose and stimulating the formation and storage of glycogen in the liver. Together, glucagon and insulin act to regulate sugar metabolism in the body.

When the islet cells are destroyed or stop functioning, the sugar absorbed from the intestine remains in the blood and is excreted by the kidneys into the urine. It is not used by the body or stored. This condition is called diabetes mellitus, or sugar diabetes. Insulin is given to patients having this disease as part of their ongoing treatment.

THE DIGESTIVE SYSTEM

The digestive system (fig. 3-51) consists of the alimentary tract—mouth, pharynx, esophagus, stomach, intestines, and certain accessory organs of digestion. As food passes through the 9-meter-long alimentary tract, digestion and absorption occur, and eventually waste material is eliminated. Secretions of the accessory organs assist in preparing food for absorption and use by the tissues of the body (table 3-2).

Digestion is both mechanical and chemical. Mechanical digestion occurs when food is chewed, swallowed, and churned by peristalsis. Waste is evacuated when the bowels move. Chemical digestion consists of changing the various foods, with the aid of enzymes, into solutions and simple compounds. Carbohydrates (starches and sugars) change into simple sugars (glucose); fats change into fatty acids; and proteins change into amino acids.


Parotid gland
Sublingual gland
Pharynx
Submaxillary gland
Esophagus
Liver
Stomach
Hepatic duct
Pylorus
Gall bladder
Cystic duct
Pancreas
Duodenum
Common Bile duct
transverse
Splenic flexure
Hepatic flexure
ascending
descending
Jejunum
Cecum
Sigmoid flexure
Vermiform Appendix
Ileum
Rectum
Anus

154.124

Figure 3-51.—The Digestive System.

MOUTH

In the mouth the TEETH mechanically break up food into small particles before it is swallowed. The salivary glands—parotid, submaxillary, and sublingual—secrete saliva, which moistens the food, makes it easier to chew, and lubricates the food mass to aid in swallowing. About 1,500 ml of saliva are secreted daily. Saliva contains one principle enzyme, ptyalin, which initiates chemical digestion of starches, breaking them into the complex sugar maltose.

The TONGUE is a muscular organ attached to the lower jaw at the back of the mouth and is the chief organ of taste. It assists in mastication, swallowing, and speech.

Table 3-2.—Principal Digestive Juices, Source and Action

Source	Digestive juice	Substance acted upon	Product
Salivary glands	Ptyalin	Starch	Complex sugar (maltose)
Gastric glands	Hydrochloric acid	Pepsinogen	Pepsin
	Pepsin	Proteins	Split proteins (proteoses, peptones)
Liver	Bile	Fats	Emulsifies fats
Pancreas	Amylase	Starch	Complex sugar (maltose)
	Proteinases (trypsin, chymotrypsin)	Proteins, split proteins	Peptides, polypeptides
	Lipase	Fats	Fatty acids, glycerol
Intestinal Glands	Carbohydrases (maltase, sucrase, lactase)	Complex sugars (maltose, sucrose, lactose)	Simple sugars (glucose, fructose, galactose)
	Peptidases	Peptides Polypeptides	Amino acids
	Lipase	Fats	Fatty acids, glycerol

PHARYNX

The pharynx (see Respiratory System) is the passageway between the mouth and the esophagus and is shared with the respiratory tract. The EPIGLOTTIS is a cartilaginous flap that closes the opening to the larynx when food is being swallowed down the pharynx. Food is deflected away from the trachea to prevent particle aspiration.

ESOPHAGUS

The esophagus is a muscular tube about 25 cm (10 inches) long. It is the passageway between the pharynx and the stomach. By means of waves of muscular contractions (peristalsis) food is pushed along this tube to the stomach. When peristalsis is reversed, vomiting occurs.

STOMACH

The stomach is a saccular enlargement of the gastrointestinal tube, connecting the lower end of the esophagus and the first portion of the small intestine (duodenum). It lies in the left upper quadrant of the abdomen. Muscular rings, or sphincters, at each end of the stomach form valves to close off the stomach and to prevent its contents from escaping in either direction while they are being mixed by peristaltic muscular contractions of the stomach wall. The sphincter at the esophageal end is the cardiac sphincter; at the duodenal end it is the pyloric sphincter.

The stomach acts as an initial storehouse for swallowed material and helps in the chemical breakdown of food substances. Small glands in the wall of the stomach secrete gastric juice, the principal components of which are hydrochloric acid and pepsinogen. Hydrochloric acid activates pepsin from pepsinogen, kills bacteria that enter the stomach, inhibits the digestive action of ptyalin, and helps regulate the opening and closing of the pyloric sphincter. The action of pepsin is confined to protein, which it splits. The stomach is half-empty within 1 hour of a normal meal and completely empty in 6 hours.

Most food absorption takes place in the small intestine. There is little food absorption in the stomach. One exception is alcohol, which is absorbed directly through the stomach wall. For this reason intoxication happens quickly when alcohol is taken on an empty stomach.

ABDOMINAL CAVITY

The stomach and intestines are enclosed in the abdominal cavity, the space between the diaphragm and the pelvis. This cavity is lined with serous membrane, the PERITONEUM. The peritoneum covers the intestines and the organs and, by secreting a serous fluid, prevents friction between the adjacent organs. The MESENTERY (double folds of peritoneum) extends from the cavity walls to the organs of the abdominal cavity, suspending them in position and carrying blood vessels to the organs.

SMALL INTESTINE

The small intestine is a muscular, convoluted (coiled) tube, about 7 meters (23 feet) long and attached to the posterior abdominal wall by its mesentery. The mesentery is gathered together like a folding fan, permitting coiling of the intestine, allowing this long organ to be contained in a relatively small space.

The small intestine is divided into three continuous parts: the duodenum, jejunum, and ileum. It receives digestive juices from three accessory organs of digestion: the pancreas, liver, and gallbladder.

The DUODENUM is about 25 cm (10 inches) long and forms a C-shaped curve around the head of the pancreas, posterior to the liver. It is lined with a mucous membrane that contains small glands. These glands secrete intestinal juices containing the enzymes carbohydrase, peptidase, and lipase.

The JEJUNUM is the middle part of the small intestine and is about 2.5 meters (7.5 feet) long. Its enzymes continue the digestive process.

The ILEUM is the last and longest part of the small intestine. Most of the absorption of food occurs in the ileum where fingerlike projections (villi) provide a large absorption surface. After ingestion it takes 20 minutes to 2 hours for the first portion of the food to pass through the small intestine to the beginning of the large intestine.

LARGE INTESTINE

The large intestine is so called because it is larger in diameter than the small intestine. It is considerably shorter, however, being about 1.5 meters (5 feet) long. It is divided into three distinct parts: the cecum, colon, and rectum.

The unabsorbed food or waste material passes through the CECUM into the COLON. The cecum is a pouch at the beginning of the large intestine, located in the lower right portion of the abdominal cavity. Twelve hours after the meal, most of the waste material passes through the colon slowly, building in mass and reaching the rectum 24 hours after the food is ingested.

The APPENDIX, a long narrow tube with a blind end, is an outpouching of the cecum located near the junction of the ileum and cecum. It has no known function but frequently becomes infected and an inflammation known as appendicitis develops.

The RECTUM is 12 cm (5 inches) long and follows the contour of the sacrum and coccyx until it curves back into the short (2.5 to 4 cm) anal canal. The ANUS is the external opening at the lower end of the digestive system. Except during bowel movement (DEFECATION), it is kept closed by a strong muscular ring, the ANAL SPHINCTER.

ACCESSORY ORGANS OF DIGESTION

The PANCREAS is a large, elongated gland lying posteriorly to the stomach. Its digestive juices amylase, proteinase, and lipase are secreted through the pancreatic duct into the duodenum and act on all types of food. The pancreas contains a special group of cells called the islands of Langerhans, which secrete the hormone insulin needed for utilization of sugar by the body.

The LIVER is the largest gland in the body. It is located in the upper abdomen on the right side, just under the diaphragm and superior to the duodenum and pylorus.

Of its many functions the following are important to remember:

- Metabolic. Metabolism of carbohydrates, fats, and proteins preparatory to their use or excretion.
- Excretion. Formation and excretion of bile salts and pigment from biliruben, a waste product of red blood cell destruction.
- Storage of blood and water and the products of carbohydrate, protein, and fat metabolism.
- Detoxification of end products of protein digestion and drugs; excess accumulation of certain hormones.
- Protection. Production of antibodies and essential elements of the blood-clotting mechanism.
- Production of heat and formation of vitamin A from carotin.

The GALLBLADDER is a pear-shaped sac, usually stained dark green by the bile it contains. It is located in a hollow on the underside of the liver. Its duct, the cystic duct, joins the hepatic duct from the liver to form the common bile duct, which enters the duodenum. The gallbladder receives bile from the liver and then concentrates and stores it. It secretes bile when the small intestine is stimulated by the entrance of fats.

THE URINARY SYSTEM

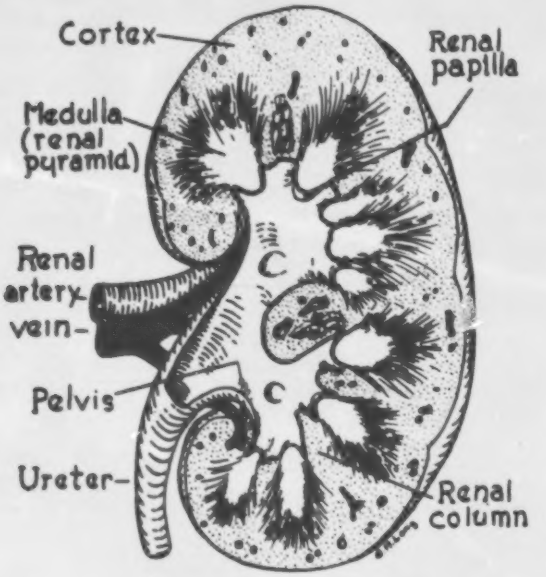
The urinary system is the primary filtering system of the body. It consists of the two glands, the kidneys, which produce urine; two tubes, the ureters, which drain the urine from the kidneys; a large reservoir, the bladder, where the urine is temporarily stored before it is excreted from the body; and a tube, the urethra, which carries the urine from the bladder to the outside of the body. All these parts, except length of urethra, are the same in both sexes.

KIDNEYS

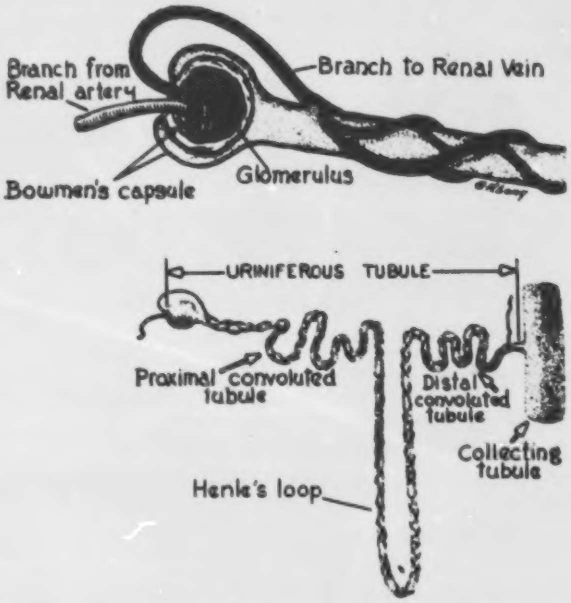
The importance of the kidney can be realized only when its structure and function are understood. It is the only part of the urinary system in which any changes occur. The bladder, ureters, and urethra store and pass only the products of the kidneys.

The kidneys are two large, bean-shaped organs designed to filter waste material from the blood (fig. 3-52). They are located in the upper posterior part of the abdominal cavity, outside the peritoneal sac, one on each side of the spinal column. The upper end of each kidney reaches above the level of the 12th rib. The suprarenal (adrenal) gland sits like a cap on top of each kidney. Each kidney weighs about 125 to 170 grams. It is protected by a considerable amount of fat and supported by connective tissue and the peritoneum. Attached to the hollow side of each kidney is the dilated upper end of the ureter forming the renal pelvis.

Structure. The kidney is composed of an external cortical and an internal medullary


Cortex
Renal papilla
Medulla (renal pyramid)
Renal artery
vein
C
C
Pelvis
Ureter
Renal column

154.125
Figure 3-52.—Cross Section of the Kidney.


Branch from Renal artery
Branch to Renal Vein
Bowmen's capsule
Glomerulus
URINIFEROUS TUBULE
Proximal convoluted tubule
Distal convoluted tubule
Collecting tubule
Henle's loop

154.126
Figure 3-53.—Functional Unit of the Kidney.

substance. The cortex or cortical substance is soft and granular and reddish brown. The urine is formed in the cortex. The medulla or medullary substance is a pyramid-shaped mass of tubes or tubules that drain the urine to the pelvis of the kidney.

Blood enters the kidney via the renal artery and is distributed to the glomerulus (fig. 3-53).

The GLOMERULUS, lying in the cortex, consists of a tuft of capillaries. This tuft is surrounded by the glomerular capsule, which is a cup-like dilation of the end of the renal tubule. This combination is called a MALPIGHIAN BODY.

The renal tubule begins with the malpighian body, takes multiple turns, forming the proximal convoluted tubule, extends toward the hilum in the medullary portion to form the descending LOOP OF HENLE, doubles back on itself as the ascending loop of Henle, and goes through several more turns as the distal convoluted tubule. The structural and functional unit of the kidney is called a NEPHRON, of which there are about one million in each kidney. For this reason a large portion of the kidney may be destroyed without serious body damage. In addition, the loss or medical donation of one kideny does not seriously affect the body's welfare if the remaining kidney is healthy.

Several of the nephrons terminate in one collecting tubule. Several collecting tubules unite to form a renal pyramid, which drains the urine into a branch (calyx) of the renal pelvis.

Function. The kidneys are effective blood purifiers and fluid balance regulators. Besides maintaining a normal pH of the blood (acid-base balance), they keep the blood slightly alkaline by removing excess substances from the blood. For example, if the blood becomes too acid they will remove acid in the form of salts; if the blood is too alkaline they will remove alkaline salts.

The main function of the kidneys is to remove the nitrogenous waste products that result when products of protein are broken up. They also remove excess sugar.

The second important function of the kidney is reabsorption of water, salts, sugar, and protein elements of the blood. This selective reabsorption keeps the blood at an acid base balance and also at a constant concentration of water, salts, and proteins. This delicate balance is necessary for normal life processes. Controlled reabsorption accounts for the amount of urine that is finally passed from the kidneys. The glomerulus filters gallons of blood each day. It is estimated that 10,000 quarts of blood pass through the kidneys in 24 hours and about 80 gallons of glomerular filtrate are formed. All the water from this filtrate is reabsorbed in the renal tubules except that containing the concentrated waste products. The amount of urine a normal person excretes varies from 1,000 to 1,500 ml per day, but a person can get by excreting only 500 ml per day.

The amount of urine excreted varies greatly with temperature, water intake, and state of health. No matter how much water you drink, the blood will always remain at a constant concentration, and the excess water will be excreted by the kidneys. A large water intake does not put a strain on the kidneys as one might think, instead it eases the load of concentration placed on the kidneys.

In blood plasma there is normally 0.03% of urea, while in the urine there is normally 67 times as much, or about 2%. This great increase is caused by the concentration of urea contained in a large kidney area in a relatively small quantity of urine.

Besides removing waste products normally found in the body, the kidneys also remove toxic substances such as certain barbituric acid derivatives, mercury, alcohol, and other drugs.

One of the familiar diseases associated with the kidneys is glomerulonephritis, which is caused by protein loss from the body due to damaged glomeruli. Another disease, though not as prevalent, is uremia. This is caused when the kidneys fail to remove the waste products from the blood, which then accumulate in high concentrations. This condition is serious and sometimes fatal.

URETERS

The ureters are two membranous tubes 1 mm to 1 cm in diameter and about 28 to 34 cm in length. Their only function is to carry urine from each kidney to the urinary bladder.

BLADDER

The urinary bladder is a musculomembranous sac located in the pelvic girdle. It functions as a reservoir for urine until it empties through the urethra.

URETHRA

The urethra is the tube that carries the urine from the bladder to the exterior. The urinary meatus is the external urethral opening. In the male the urethra is common to the urinary and reproductive systems, in the female it belongs only to the urinary system.

The female urethra is about 4 cm long, extending from the bladder to the external orifice in the vestibule. It is embedded in the anterior wall of the vagina and surrounded by the sphincter urethrae.

The male urethra is about 20 cm long and is divided into three parts: the prostatic, membranous, and penile portions. The prostatic urethra is surrounded by the prostate gland; it contains the orifices of the prostatic and ejaculatory ducts. This portion of the male urethra is about 2.5 cm long. The membranous urethra is about 2 cm in length and is surrounded by the external sphincter. The penile urethra, the longest portion, is about 15 cm long. It lies in the ventral portion of the penis, extending to its external opening.

MALE REPRODUCTIVE SYSTEM

The male organs of reproduction are the penis and testes (testicles), and associated ducts and glands (fig. 3-54).

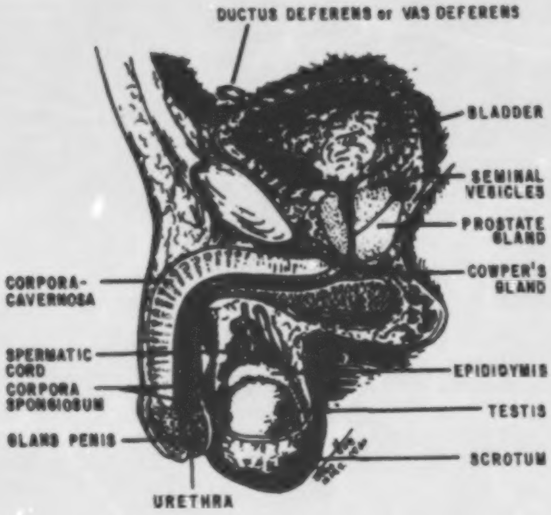


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Figure 3-54.—The Male Reproductive System.

SCROTUM

The SCROTUM is a cutaneous pouch containing the testes and part of the spermatic cord. Immediately beneath the skin is a thin layer of muscular fibers (cremaster), which is controlled by temperature and contracts or relaxes to lower or raise the testes in relation to the body. This muscular activity of the scrotum is necessary to regulate the temperature of the testes, which is important in the maturation of sperm cells.

TESTES

The TESTES are oval glands suspended by the spermatic cord in a pouch. They perform two functions: production of spermatozoa (sperm) and secretion of the male sex hormone testosterone.

Lying close to the superior pole of each testis is the EPIDIDYMIS, a ductal system that collects and transmits sperm from the testes.

SPERMATIC CORDS

The two spermatic cords, each of which suspends and supplies a testis, are formed by the ductus deferens, arteries, veins, lymphatics, and nerves, bound together by connective tissue.

DUCTUS DEFERENS (VAS DEFERENS)

The ductus deferens is a small tube that connects the epididymis and ejaculatory duct. It ascends as part of the spermatic cord through the inguinal canal into the pelvic cavity and transmits the sperm to the ejaculatory duct.

SEMINAL VESICLES

The seminal vesicles are two pouches that lie between the bladder and the rectum. They secrete and store a fluid to be added to the secretion of the testes at the time of ejaculation.

EJACULATORY DUCT

The ductus deferens and the ducts from the seminal vesicles converge to form the short ejaculatory duct that leads into the prostatic urethra. Its function is the transportation of secretions.

PENIS

The penis is composed of three cylindrical bodies of spongy cavernous tissue, bound together by connective tissue and loosely covered by a layer of skin. Two of the bodies, the corpora cavernosa, lie superiorly side by side; the third body, the corpora spongiosum, is median, lying in the groove between the other two. The dilated distal end of the corpora spongiosum is known as the glans penis. The cavernous tissue becomes greatly distended with blood during sexual excitement, causing erection of the penis. The loose skin of the penis folds back on itself at the distal end, forming the prepuce, or foreskin, and covers the glans. Frequently the prepuce is surgically removed (circumcision) to prevent irritation and to facilitate cleanliness.

PROSTATE GLAND

The prostate is made of smooth muscle and glandular tissue that surrounds the first part of the urethra. It resembles a chestnut in shape and size. It secretes an alkaline fluid to keep the sperm mobile and protect it from the acid secretion of the female vagina. This substance is discharged into the urethra as part of the ejaculate, or semen, during the sexual act.

BULBOURETHRAL GLANDS (COWPER'S GLANDS)

Cowper's glands are two pea-sized bodies, one on either side of the membranous portion of the urethra, the excretory ducts of which open into the urethra. They secrete a mucouslike alkaline fluid during the sexual act to provide lubrication.

SEMEN

Semen is made of sperm and secretions from the seminal vesicles, prostate, and Cowper's glands. It is discharged as the ejaculate during sexual intercourse. There are millions of sperm cells in the semen of each ejaculation, but only one is needed to fertilize the ovum. It is generally considered that fertilization of the ovum occurs while it is still in the uterine tube. Therefore it is apparent that sperm cells can move actively in the seminal fluid deposited in the vagina and through the layers of the secretions lining the uterus and the uterine tubes.

Although the prostate, seminal vesicles, and bulbourethral glands secrete most actively during sexual intercourse, a certain amount is being formed continuously. During periods of prolonged sexual abstinence, discharge of this accumulation may occur spontaneously during sleep as a nocturnal emission or "wet dream." This is an entirely normal condition and does not constitute a harmful or disease state; on the other hand, retention of these secretions in no way impairs health or the mental state.

At times, what appears to be semen may drip from the penis on straining to move the bowels. This is the secretion of the prostate and seminal vesicles being forced out by the increased pressure within the abdominal cavity and forceful passage of feces through the rectum, which lies close to these structures. This occurrence does not indicate disease or infection if urethral discharge is present only during acts of straining. Any continuing discharge should be examined for evidence of infection.

FEMALE REPRODUCTIVE SYSTEM

The female reproductive system (fig. 3-55) includes the ovaries, the fallopian (uterine) tubes, the uterus, the vagina, the external genitalia (vulva), and the breasts (mammary glands), which are not shown in the figure but will be discussed.

EXTERNAL GENITALIA

The external genital organs, referred to collectively as the vulva, include the mons pubis, labia majora, labia minora, clitoris, vestibule, Bartholin's glands, and hymen. The mons pubis is the pad of fatty tissue beneath the skin, anterior to the symphysis pubis. The labia majora are two folds of skin extending from the mons pubis anteriorly to the perineum (the region between the vaginal orifice and the anus). Within these two folds of skin are two smaller folds, called the labia minora, extending from the clitoris to either side of the vaginal orifice. The clitoris is a small body richly endowed with nerves, highly sensitive, and of significance in sexual stimulation. The clitoris becomes engorged with blood during sexual excitement, but, unlike its male counterpart, the penis, it does not become erect. It is located at the point where the two labia minora meet. The vestibule is the area between the labia minora into which the urethral and vaginal orifices open. The urinary meatus is the external urethral orifice situated inferior to the clitoris and superior to the vaginal orifice. The vaginal orifice is situated inferior to the urethra. The Bartholin's glands are the female counterparts of the Cowper's glands in the male. They consist of two small roundish bodies on either side of the vaginal opening. Each gland is connected with the vagina by means of long ducts and secretes a viscid, alkaline fluid lubricant between the labia minora and the hymen. Finally, the hymen is a fold of mucous membrane that extends across the lower part of the vagina. It is not a very reliable indicator of virginity.

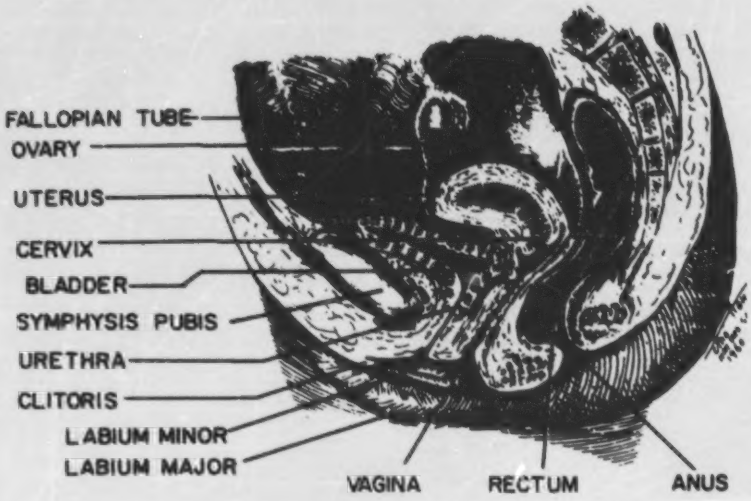

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Figure 3-55.—The Female Reproductive System.

MAMMARY GLANDS

The mammary glands, or breasts, are accessory organs of the female reproductive system. They develop during puberty under the influence of the hormones estrogen and progesterone. The breasts are responsible for the secretion of milk (lactation) for the nourishment of newborn infants.

Structurally the breasts resemble sweat glands. At the center is a nipple containing 15 to 20 depressions, into which ducts from the lobes of the gland empty. During pregnancy hormones secreted by the ovaries cause the glandular tissue to grow in preparation for lactation. After childbirth hormones secreted by the anterior lobe of the pituitary gland stimulate production for 6 to 9 months.

OVARIES

The ovaries (female gonads) are two almond-shaped glands suspended by ligaments in the upper pelvic cavity, one on either side of the uterus, posterior and inferior to the fallopian tubes. Their prime function is to produce the ova and the female hormones estrogen and progesterone. Although these hormones are manufactured by the ovaries, their production is controlled by the anterior pituitary gland. These hormones play essential roles in the development of secondary sex characteristics, the reproductive cycle, gestation, and lactation.

The graafian follicles are microscopic pockets in the ovaries. Once a month, under hormonal influence, a follicle matures, ruptures, and expels its ovum into the uterus. Each ovary normally releases an ovum every 56 days, the right and left ovary alternately discharging an ovum every 28 days. The menstrual cycle in most women is therefore 28 days in length.

FALLOPIAN TUBES

The fallopian (uterine) tubes are composed of internal mucous, middle muscular, and outer serous coats that are continuous with the layers of the uterus. They serve as ducts of the ovaries, providing a passageway to the uterus. These tubes are in contact with the ovaries but are not continuous with them. Their funnel-shaped openings, called free openings, are fringed with fingerlike processes that pick up an ovum and draw it into the fallopian tubes, where it is transported to the uterus by peristalsis and gravity. Fertilization of an ovum normally takes place in the fallopian tubes.

UTERUS

The uterus (womb) is a hollow, pear-shaped organ with thick, muscular walls. It is lined with a specialized epithelium, called endometrium, which undergoes partial destruction about every 28 days in the nonpregnant woman.

The uterus averages 7 cm in lengh and 5 cm in width. It has three openings: the openings of the fallopian tubes laterally and the opening into the vagina. The parts of the uterus are the body, which is the large upper portion, and the cervix, which is the smaller portion that projects into the upper part of the vagina. The cervical opening into the vagina is called the external os. The walls of the uterus are highly flexible and are composed of three layers that are continuous with the respective layers of the fallopian tubes.

In addition to being the focal point of the endometrial (menstrual) cycle, the uterus is the site of implantation, growth, and development of the fertilized ovum. The muscular walls of the uterus produce powerful rhythmic contractions that are important in the expulsion of the fetus at birth.

VAGINA

The vagina is a musculomembranous, collapsible tube capable of great distention. It is lined with mucous membrane that extends from the cervix to the vulva. The canal is about 7.5 cm long, and its lining membrane, which is greatly folded, is continuous with the inner lining of the uterus. The vagina is the organ that receives the male sperm during intercourse. It also forms the lower portion of the birth canal, stretching widely during delivery. In addition, it serves as an excretory duct for uterine secretions and menstural flow.

RECURRING CYCLES

When females reach puberty, they begin to experience the two recurring female cycles, the ovarian and endometrial.

As previously mentioned, each ovary produces a mature ovum every 56 days. They expel their ova on an alternating basis, approximately one every 28 days. The length of this cycle may vary markedly from individual to individual and between cycles of the same individual. On the first day of menstruation several ova within the graffian follicles begin to mature, and normally one will be expelled 14 days before the next menstrual flow. This is the ovarian cycle.

The endometrial cycle centers around the periodic development and breakdown of the endometrial lining of the uterus. The first phase of the cycle is the menses, or menstruation. It begins when the endometrial lining starts to slough off from the walls of the uterus, and it is characterized by bleeding from the vagina. This is day one of the cycle, and this phase usually lasts through day five. The time between the last day of the menses and ovulation is known as the postmenstrual phase. It lasts from day 6 through day 13 or 14 and is characterized by proliferation of endometrial cells in the uterus, which develop under the influence of the hormone estrogen. Ovulation is the rupture of a graafian follicle with the release of a mature ovum into the fallopian tubes. It usually occurs on day 14 or 15 of the cycle. The postovulatory (premenstrual) phase is the time between ovulation and the onset of the menses and normally lasts 14 days. During this phase the ovum travels through the fallopian tubes to the uterus. If the ovum becomes fertilized during this passage, it will become implanted in and nurtured by the newly developed endometrial lining. However, if fertilization does not take place, the lining deteriorates and eventually sloughs off, marking day 1 of the next cycle.

CHAPTER 4

FIRST AID AND EMERGENCY PROCEDURES

GENERAL CONSIDERATIONS

For a Navy corpsman, first aid and emergency procedures are the professional care of the sick and injured before definitive medical attention can be obtained. Appropriate care may range from an encouraging word to a dramatic struggle to draw a person back from the brink of death. At all times, however, it must be remembered that first aid measures are temporary expedients whose purpose is to save life, to prevent further injury, and to preserve resistance and vitality. These measures are not meant to replace proper medical diagnosis and treatment procedures. A corpsman who understands this point, who knows the limits of the professional care a corpsman can offer, and who is motivated to keep abreast of new first-aid equipment and procedures, will be able to provide the competent care that will make the differences between life and death, temporary and permanent injury, and rapid recovery or long-term disability.

GENERAL FIRST AID RULES

There are a few general first-aid rules that you should follow in any emergency situation:

1. Take a moment to get organized. On your way to an accident scene, use a few seconds to remember the basic rules of first aid. Remain calm as you take charge of the situation, and act quickly but efficiently. Decide as soon as possible what has to be done and which one of the patient's injuries needs attention first.

2. Unless contraindicated, make your preliminary examination in the position and place you find the victim. Moving the victim before this check could gravely endanger life, especially if the back or ribs are broken. Of course, if the situation is such that you or the victim is in danger, you must weigh this threat against the potential damage caused by premature transportation. If you decide to move the victim, do it quickly and gently to a safe location where proper first aid can be administered.

3. Examine the victim for hemorrhage, breathing cessation, and shock, the foremost life-threatening conditions. Remember that irreversible brain damage can occur within 4 minutes if breathing has stopped. Bleeding from a severed main artery can lethally drain the body in even less time. If both are severe, and you are alone, quickly handle the major hemorrhaging first, and then work to get oxygen back into the system. Shock may allow the rescuer a few minutes of grace but is no less deadly in the long run.

4. Examine the victim for fractures, especially in the skull, neck, spine, and rib areas. Premature moving of the patient with any of the above areas fractured can easily lead to increased damage, permanent injury, or death. Fractures of the innominate or extremities, though not as immediately life-threatening, may pierce vital tissue or blood vessels if mishandled.

5. Remove enough clothing to get a clear idea of the extent of the injury. Rip along the seams, if possible, or cut. Removal of clothing in the normal way may aggravate hidden injuries. Respect the victim's modesty as you proceed, and do not allow the victim to become chilled.

6. Keep the victim reassured and comfortable. If possible, do not allow the victim to see the wounds. The victim can endure pain and discomfort better if confident in your abilities. This is important because under normal conditions the corpsman will not have strong pain relief medications right at hand.

7. Avoid touching open wounds or burns with your fingers or unsterile objects, except if clean compresses and bandages are not available and it is imperative to stop severe bleeding.

8. Unless contraindicated, position the unconscious or semiconscious victim on his or her side or back with the head turned to the side to minimize choking or aspirating of vomitus. Never give an unconscious person any substance by mouth.

9. Always carry a litter patient feet first so that the rear bearer can constantly observe the victim for respiratory or circulatory distress.

ASSESSING THE PATIENT'S CONDITION

The following procedures for assessing a patient's condition under various circumstances are based upon Department of Transportation (DOT) recommendations. They are general guidelines that can be adjusted to the situation at hand.

DETERMINING THE PROBLEM

A. If the patient can communicate, determine if the problem is medical or trauma-related.

1. If medical, follow sequence below.
   a. Evaluate diagnostic and vital signs (VS).
   b. Develop patient's history.
   c. Examine for medical problem.
   d. Examine for trauma-related problem.
2. If trauma-related, follow sequence below.
   a. Examine the injury.
   b. Develop patient's history.
   c. Evaluate diagnostic and VS.
   d. Examine for medically-related problems.

B. If the patient cannot communicate, follow the sequence below.

1. Evaluate diagnostic and VS.
2. Develop patient's history, then determine if problem is medical or trauma-related.
3. If medical, examine first for medical problem, then for trauma-related problem.
4. If trauma-related, examine first for trauma-related problem, then for a medical problem.

EVALUATING THE DIAGNOSTIC AND VS

A. Sequence of taking VS

1. If patient with traumatic injury is communicative, take signs after assessing injury site.
2. If the patient with medical problem is communicative, take signs after primary assessment and in conjunction with medical history, if possible.
3. If patient is noncommunicative, take signs immediately after primary assessment.

B. Essential diagnostic and VS

1. Mental status
   a. Consciousness—avoid descriptive words like "stupor;" be specific.
   b. Reaction to stimulus—describe
   c. Orientation
   d. Responsiveness

2. Respirations
    a. Tracheal deviation
    b. Rate-tachypnea
    c. Depth
        (1) Hyperpnea
        (2) Hypopnea
    d. Dyspnea
    e. Breathing sounds
    f. Flaring of anterior nares on inspiration
    g. Retraction of suprasternal notch on inspiration
    h. Retraction of intercostal spaces
3. Pulse
    a. Rate
    b. Rhythm
    c. Strength
4. Blood Pressure

EXAMINING FOR TRAUMA-RELATED PROBLEMS

A. Assess each of the following
    1. Head
        a. Inspect for
            (1) Obvious hemorrhage
            (2) Ecchymosis, erythema, contusions
            (3) Scalp lesions
        b. Palpate for
            (1) Lumps
            (2) Depressions
            (3) Pain on compression of skull (Do not compress if patient is noncommunicative!)
    2. Eye
        a. Inspect for
            (1) Lacerations to lid or globe
            (2) Foreign matter in eye
            (3) Anisocoria
            (4) Eye movements
            (5) Pupillary reaction
        b. Palpate for
            (1) Swelling in orbital or periorbital area
            (2) Failure to sense touch in supra- and infra-orbital areas if patient is communicative

    3. Ear—inspect for
        a. Discharge from external auditory canal
        b. Ecchymosis over mastoid (Battle's sign)
        c. Lacerations
        d. Bleeding

    4. Nose—inspect for
        a. Rhinorrhea
        b. Patent nostrils
        c. Bleeding
        d. Flaring of anterior nares on inspection

    5. Mouth
        a. Inspect for
            (1) Potential airway obstruction
            (2) Edema or hematoma
            (3) Bleeding
            (4) Teeth or dentures lodged in pharynx
            (5) Misalignment of teeth
            (6) Pain when biting teeth together
        b. Palpate for fractures
            (1) Zygomatic bones
            (2) Mandible
            (3) Maxilla

    6. Neck
        a. Inspect for
            (1) Retraction at suprasternal notch on inspiration; tracheal deviation
            (2) Deviation of trachea from midline
        b. Auscultate for air sounds in trachea

    7. Skin—inspect for
        a. Jaundice
        b. Cyanosis
        c. Diaphoresis
        d. Temperature
        e. Clammy
        f. Pallor

8. Thorax
   a. Inspect for
      (1) Respiration
         (a) Rate—tachypnea
         (b) Depth
            1 Hyperpnea
            2 Hypopnea
         (c) Retraction of intercostal space
      (2) Chest elevation symmetry—flail chest
      (3) Lacerations, puncture, or ecchymosis
   b. Palpate
      (1) Vertebrae and ribs for symmetry and tenderness
      (2) Anterior to posterior compression of thorax
      (3) Lateral-to-lateral compression of thorax
      (4) Compression of clavicle
      (5) Cranial to chordal compression
      (6) Pressure of costochondral junction
      (7) Compression on costovertebral angles
   c. Auscultate for lung and heart sounds
      (1) Lung sounds
         (a) Absent or unequal breath
         (b) Characteristics
            1 Rales
            2 Rhonchi
            3 Wheezes
            4 Stridor
      (2) Heart sounds
   d. Percussion
      (1) Fluid in thorax
      (2) Pneumothorax or collapsed lung

9. Abdomen
   a. Inspect for
      (1) Lacerations, ecchymosis, burns, etc.
      (2) Hematoma
      (3) Flexion of hips to relieve pain
   b. Auscultate bowel sounds
   c. Palpate firmly for
      (1) Distended abdomen
      (2) Guarding
      (3) Local tenderness
      (4) Rebound pain

10. Extremities
   a. Inspect for
      (1) Abnormal angulation or bone ends protruding
      (2) Presence of extremity pulse
         (a) Dorsalis pedis
         (b) Radial
      (3) Nail bed color (cyanosis)
      (4) Impaired sensation
      (5) Inability to move joint
      (6) Lacerations, ecchymosis
      (7) Needle marks, bites
   b. Palpate for abnormal reaction

11. Central nervous system (CNS)
   a. Inspect for
      (1) Mental state
         (a) Consciousness
         (b) Orientation
         (c) Response to verbal stimulus and pain
      (2) Gross deformities
      (3) Lacerations
      (4) Decerebrate posturing
      (5) Decorticate posturing
   b. Palpate for
      (1) Tenderness
      (2) Deformities

EXAMINING FOR MEDICAL PROBLEMS

A. Assess each of the following areas
   1. Neck
      a. Inspect for jugular vein distention
      b. Auscultate trachea for adequate airflow
   2. Thorax and lungs
      a. Inspect for evidence of pain while breathing or moving
      b. Auscultation
         (1) Rales
         (2) Rhonchi
         (3) Wheezes
         (4) Stridor
      c. Palpate to determine symmetry of breathing
      d. Percuss for
         (1) Hemothorax
         (2) Pneumothorax
   3. Thorax and heart—auscultate for abnormal heart sounds
   4. Abdomen
      a. Inspect for
         (1) Flexion of hips to relieve pain
         (2) Normal contour during breathing
         (3) Distention
      b. Auscultate for sounds
      c. Palpate
         (1) Distention
         (2) Guarding
         (3) Local tenderness
         (4) Rebound pain
   5. CNS
      a. Inspect for
         (1) Mental state
         (2) Pupil reaction
         (3) Eye movements
         (4) Muscle tone
         (5) Paralysis
      b. Palpate for
         (1) Loss of feeling
         (2) Absent reflexes
         (3) Muscle tone
         (4) Paralysis

DEVELOPING THE MEDICAL HISTORY

The patient's history is an important information source that will directly influence both the treatment offered by the corpsman at the accident scene and the care given in the hospital. The history is acquired by observing for clues and careful questioning of the patient, family, and bystanders. A history is divided into three parts: the history of the immediate situation, the patient's medical history, and the family medical history. (The family history is usually not relevant in the field with a trauma patient.)

A history of the present illness is a directed history, striking a balance between allowing the patient to ramble and leading the patient. The purpose is to discover why you were called. In general, the following information must be gathered:

A. Gross problem identification
   (1) Chief complaint
   (2) How does the patient feel
B. Location of problem
   (1) Pain
   (2) Other symptoms (e.g., dizziness, shortness of breath)
C. Quality of symptom(s)
   (1) How does it feel
   (2) What does it resemble
D. Quantity of symptom(s)
   (1) Pain intensity
   (2) Effect on normal functioning
E. Chronology of symptom(s)
   (1) Time of onset
   (2) Duration
   (3) Frequency
F. Cause of trauma
   (1) What happened?
   (2) Any contributing physical cause?
   (3) How did injury take place (e.g., patient's head hit corner of table during fall)?
G. Scenario of first medical symptoms
   (1) Where did first symptoms occur?
   (2) What was the patient doing?
H. Aggravating and alleviating movements
I. Associated complaints
   (1) Other symptoms
   (2) Affected normal body functions

The following are components of a complete history of a patient's medical problems.

A. General health before the current problem
B. Name of family physician or location of health records
C. Current medications and treatments
D. Recent injuries
E. Allergies
F. Family medical history
    1. General health of family members
    2. Recent family illnesses

FIRST AID EQUIPMENT AND SUPPLIES

In a first-aid situation the corpsman must always be ready to improvise. In the majority of emergency situations, standard medical supplies and equipment will not be immediately available or they may run out. Later sections of this chapter will discuss how materials can be used as substitutes.

When medical supplies and equipment are available, they will probably be found in an ambulance or in the field medical Unit One bag.

Navy ambulances are stocked in accordance with the BUMED Instruction 6700.26 series. Table 4-1 lists equipment currently authorized. Table 4-2 lists the contents of an emergency bag that a corpsman might find in an ambulance. Table 4-3 lists the contents of the Unit One bag.

Table 4-1.—First Aid Equipment and Supplies Stocked in a Navy Ambulance

Resuscitator, hand operated

Airway, pharyngeal, plastic, adult-child

Cannula, tracheotomy, sizes 4 and 6

Resuscitator, Aspirator

Splint, arm and leg, pneumatic, adult

Surgical instrument and supply set, individual

Regulator, pressure, medical gas administration, with flowmeter

Table 4-2.—Contents of an Ambulance Emergency Bag

Regular drip
18 gauge Medicut
16 gauge Medicut
Airways (variable sizes)
Sodium Chloride Ampules
19 gauge butterflies
Y-connector
Tourniquet
Tongue blades
Klings
Ammonia ampules
Stethoscope
Examination gloves
Adult mask
Nasal cannula
Lubricant
Ambu bag
Mini drip
Ace wrap
20 gauge needles
Syrup of Ipecac
10 cc syringes
Trach adapter
Straight connector
Safety pins
Alcohol swabs
Tape
Arm slings
Extension tubing
Suction tube
Oxygen tubing
4 x 4's
Toomy syringe
Grease Pencil

Table 4-3.—Medical Instrument and Supply Set, Individual (Unit One)

a. Descriptions
    (1) weight 9 lbs
    (2) 4 strong compartments
    (3) adjustable carrying strap
    (4) made of nylon

b. Contents
    (1) one role wire fabric, 5" x 36"
    (2) two bottles of aspirin, 5 gr, 100's
    (3) three packages of morphine inj., ¼ g, 5's
    (4) one bottle tetracaine opthalmic sol.
    (5) three bottles providine-iodine sol. ½ fl oz.
    (6) two packages atropine inj., 12's
    (7) two muslin triangular bandages
    (8) two medium battle dressings, 7¼ x 8
    (9) eight small battle dressing, 4 x 7
    (10) one roll adhesive tape, 3" x 5 yds
    (11) six packages of Band-Aids, 6's
    (12) one pair scissors, bandage
    (13) one tourniquet
    (14) one airway, plastic, adult/child
    (15) one thermometer, oral
    (16) one card of safety pins, medium, 12's
    (17) one surgical instrument set, minor surgery
    (18) two books field medical cards
    (19) one pencil, black lead, mechanical
    (20) two packages gauze, roller, 3" x 5 yds

Unique operational requirements or command decisions may modify the makeup of any of the lists. It is up to the corpsman to be familiar with the emergency medical equipment at the command since the call may come at a moment's notice to use any of these items to help save or sustain a life.

TRIAGE

A final general first-aid consideration is triage, the evaluation and classification of casualties for the purpose of establishing priorities for treatment and evacuation. Sorting decisions may vary depending upon the situation. The person in charge is responsible for the balancing of human lives against the realities of the tactical situation, the level of medical stock on hand, and the realistic capabilities of the medical staff. Sorting decisions may be made at every stage in the movement of the wounded. The following discussion refers primarily to the battalion aid station (BAS) where helicopter or rapid land evacuation is not available, or to the shipboard battle-dressing station. Triage in a civilian environment may vary considerably, depending on the situation.

Sorting for Treatment

Immediately upon arrival at an aid station, sort the casualties into groups in the order listed below:

Group 1. Those whose injuries are so slight that they can be managed by self-help or buddy-care. These casualties can be returned to their units promptly for full duty.

Group 2. Those whose wounds require medical care, but are so slight that they can be managed by hospital corpsmen and returned to duty after a brief period.

Group 3. Those whose injuries demand surgical attention (a) immediately, (b) after resuscitation efforts, or (c) as soon as practical. Medical officers must spend most of their time with this group.

Group 4. Those hopelessly wounded or dead on arrival.

Sorting for Evacuation

During the Vietnam war, the techniques of helicopter medical evacuation were improved so most casualties could be evacuated to a major medical facility within minutes of their injury. This considerably lightened the load of the hospital corpsman in the field since provision of long-term care before the evacuation was not normally required. However, rapid aeromedical response did not relieve the corpsman of the responsibility for giving the best emergency care within the field limitations in order to stabilize the victim before the helicopter arrived. Triage was seldom a problem since most of the injured could be evacuated quickly.

New developments in warfare, along with changes in the probable theaters of deployment, indicate that the helicopter evacuation system may no longer be viable in a front-line environment. If this becomes the case, longer group chains of evacuation to the BAS or division clearing station may be required. This will increase the need for the life stabilizing activities before each step in the chain and in transit. Evacuation triage will normally be for personnel in the group 3 treatment category, based on the tactical situation and the nature of the injuries. Groups 2 and 4 may have to receive their treatment at the BAS level. Group 1 would be treated on the line.

BASIC LIFE SUPPORT

Basic life support is the emergency techniques for recognizing and treating failures of the respiratory system and heart function. The primary emphasis is placed on maintaining an open AIRWAY to counter upper airway obstruction; restoring BREATHING to counter respiratory arrest; and restoring CIRCULATION to counter cardiac arrest. These are the ABCs of basic life support.

UPPER AIRWAY OBSTRUCTION

In the adult, a very common cause of upper airway obstruction is improperly chewed food particles that become lodged in the throat (cafe coronary). Children also have a disturbing tendency to swallow foreign objects in their play. Another major cause is unconsciousness, when the tongue may slide back into the pharynx and block the airway (figure 4-1). Normally, the heart continues to beat until oxygen deficiency becomes acute, so CPR is not always immediately indicated. Periodic checks of the carotid pulse must be made, however, to ensure that circulation is being maintained.

The signs of partial airway obstruction include deep, gasping, labored breathing, cyanosis, clutching movements toward the throat, and excessive respiratory muscle contractions. Complete blockage is usually indicated by inability to speak, clutching movements toward the throat, cyanosis, and no detectable air movement through the mouth or nose. Respiratory muscle efforts may be excessive or minimal. A complete blockage is also indicated if a perfectly executed attempt to perform artificial ventilation fails to instill air into the lungs.

To check an unconscious victim for breathing, put your ear next to the victim's nose and mouth to listen and feel for air exchange. You can also look for chest and abdominal movement, but these are harder to gauge, especially if the victim is clothed. Check the carotid pulse and be prepared to start CPR.

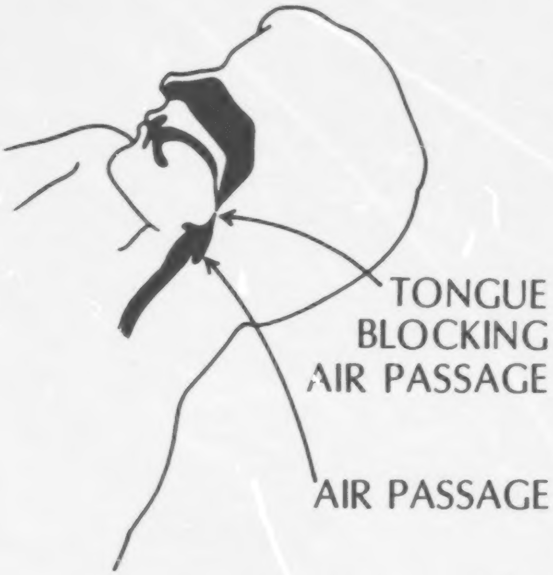

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Figure 4-1.—Blocked Airway.

To check a conscious victim for breathing, look, listen, and ask the person to speak. Speech indicates the upper airway is not completely obstructed.

If a partial upper airway obstruction is indicated, attempt to clear the mouth, and use the head tilt or jaw tilt maneuvers described below to bring relief. Observe the victim closely for increased distress; be prepared to treat for a completely blocked airway and/or start CPR; and transport to a medical facility.

If a complete upper airway obstruction is indicated, follow the backslap and abdominal thrust or chest thrust maneuvers described below. Once relief is obtained, continue to observe the victim until you are certain that the obstruction has been completely removed. If distress returns, or the obstruction has only been partially removed, transport the victim to a medical facility, and be prepared to start CPR.

Opening the Airway (Partial Obstruction)

The first step is to clear the mouth of mucus, food particles, foreign objects, or loose dentures. This is done by turning the head to the side and opening the mouth with one hand while the other sweeps the matter out. Sufficient airway relief may then be obtained by using the head-tilt or jaw-tilt methods of opening the airway. This may sustain breathing until the obstruction can be removed. NOTE: Before going further, it is imperative that corpsmen remember to check all victims for possible spinal injuries before any repositioning is attempted. If there is no time to immobilize these injuries and the airway cannot be opened with the victim in the present position, then great care must be taken when repositioning. The head, neck, and back must be moved as a single unit. To do this, adhere to the following steps (see figure 4-2).

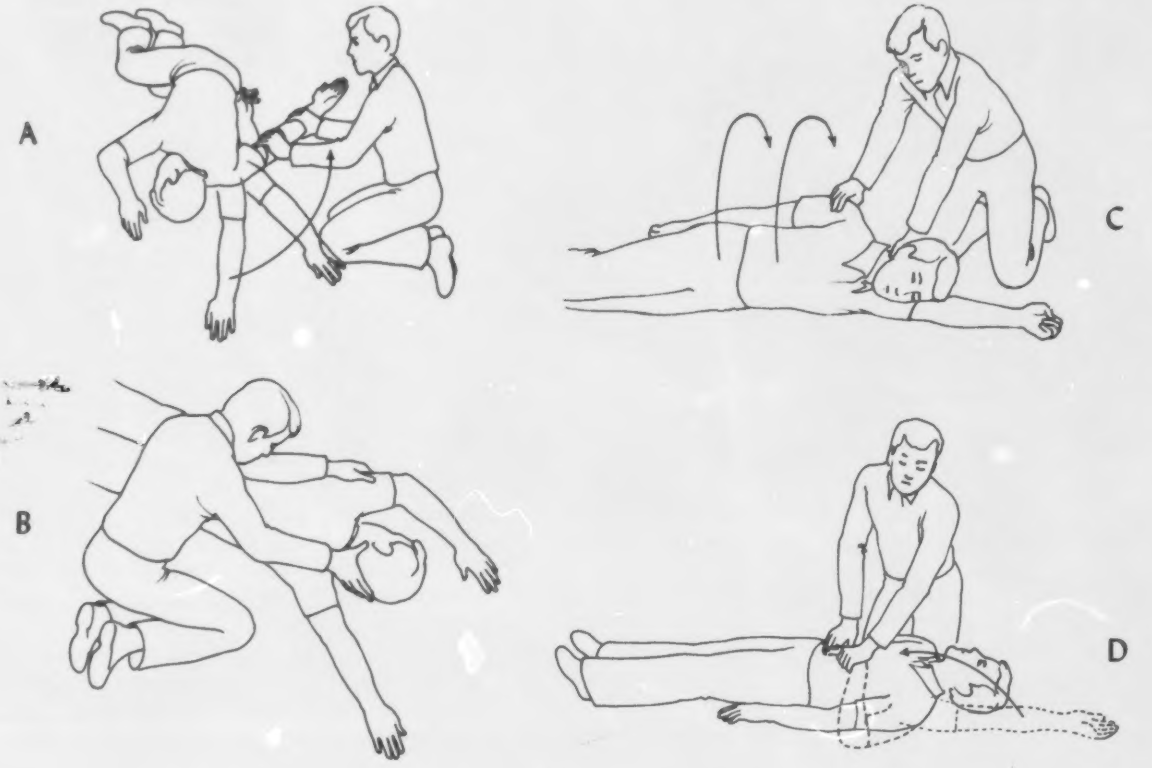

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Figure 4-2.—Repositioning the victim of spinal injuries.

- Kneel to the side of the victim in line with the victim's shoulders but far enough away so that the victim's body will not touch yours when it is rolled toward you.
- Straighten the victim's legs, gently but quickly.
- Move the victim's closest arm along the floor until it reaches straight out past the head.
- Support the back of the victim's head with one hand while you reach over with the other hand to grab the far shoulder.
- Pull the far shoulder toward you while at the same time keeping the head and neck in a natural straight line with the back. The head resting on the extended arm will help you in this critical task.

Head Tilt

The head-tilt technique is performed with the victim supine and the rescuer kneeling at the victim's side—head level with the victim's head and neck. Place one hand on the victim's forehead and the other under the neck. Apply pressure on the forehead and at the same time lift the neck. Tilting the head in this manner opens the airway (figure 4-3).

Jaw Tilt

A second technique for opening the airway is the jaw tilt. This technique is accomplished by kneeling by the top of the victim's head and placing your fingers behind the angles of the lower jaw, or hooking your fingers under the

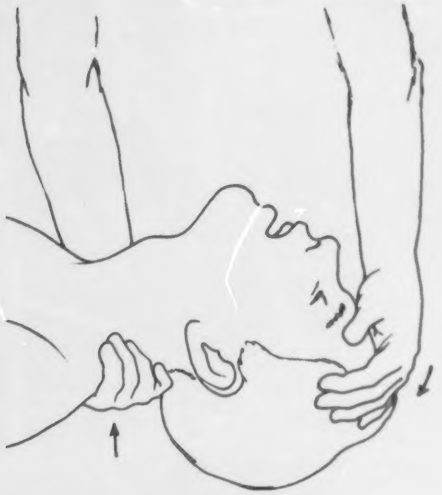

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Figure 4-3.—Head tilt.

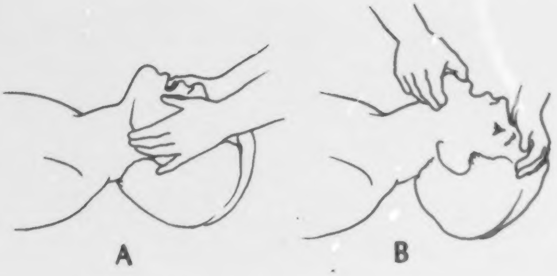

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Figure 4-4.—Jaw tilt.

jaw, then bringing the jaw forward. Separate the lips with your thumbs to allow breathing through the mouth as well as the nose (figure 4-4). This technique is to be used if a neck injury is suspected.

Either the head tilt or the jaw tilt will offer some relief for most forms of airway obstruction. They also prepare the airway for artificial ventilation. If the airway is still seriously obstructed it may be necessary to try to remove the obstruction by using the backslap and abdominal thrust or chest thrust methods indicated for opening a completely obstructed airway.

Opening the Airway (Complete Obstruction)

If a complete upper airway obstruction is indicated, the backslap and thrust techniques described below will be used in quick alternating succession until relief is obtained.

Backslap

With your open hand, sharply slap the victim on the back between the shoulder blades. Place the other hand on the chest to support the victim. Give four sharp blows while the victim attempts to cough up the obstruction, working with the attempts at coughing rather than against. If the victim is lying down, kneel and pull the victim toward you until the victim's chest is resting against your knees. Then administer the open hand slaps as illustrated in figure 4-5.

For infants or small children, use one arm to lift and support the child around the waist, allowing the head to bend forward and down. The backslap is then delivered with the free hand.

Abdominal Thrusts

If the blows are unsuccessful, use the abdominal thrust, which makes use of the air reserve in the lungs. It is also highly effective in removing water from the lungs of drowning victims.

Abdominal Thrust Standing Technique.—Stand behind the victim and wrap your arms around the victim's waist, as illustrated in figure 4-6. Make a fist with one hand and place it thumbside against the abdomen along the midline and slightly above the navel. Grasp the fist with the other hand (see figure 4-7). Give four quick upward thrusts to the victim. The obstruction should pop out like a champagne cork.

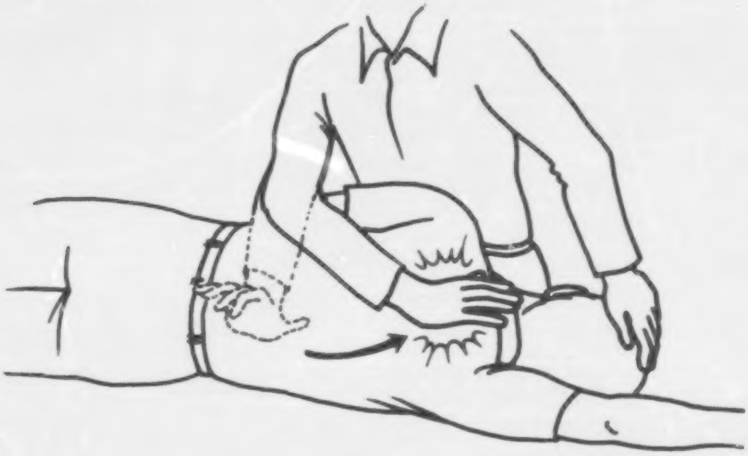

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Figure 4-5.—Backslap technique to clear airway.

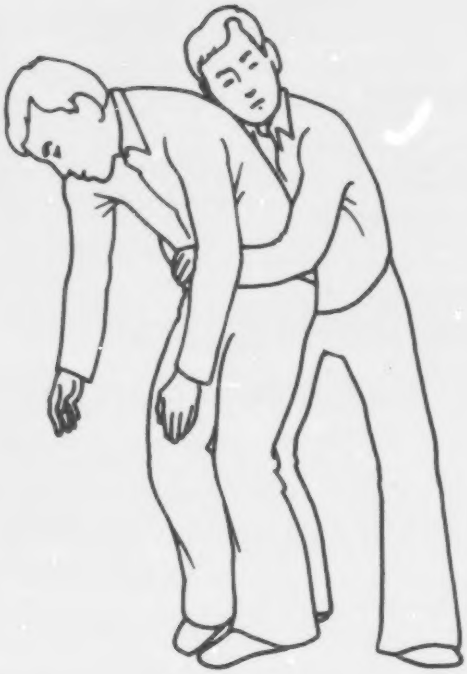

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Figure 4-6.—Position for standing abdominal thrust.

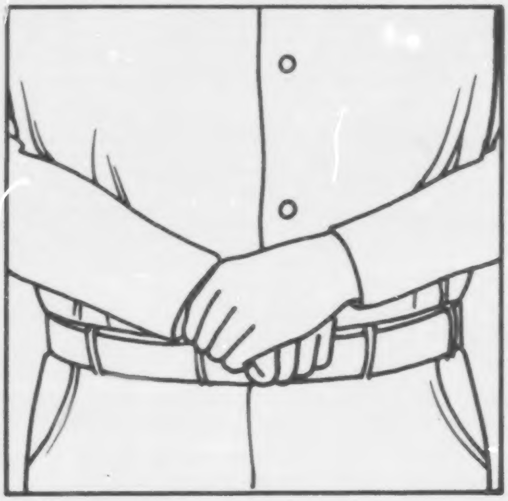

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Figure 4-7.—Correct hand positioning for abdominal thrust.

Abdominal Thrust Reclining Technique.—Position yourself for the thrust by straddling the victim at the hips. Place the heels of your hands one on top of the other, along the midline, slightly above the navel, and give quick upward thrusts into the abdomen as illustrated in figure 4-8. Note that the victim must be lying face up.

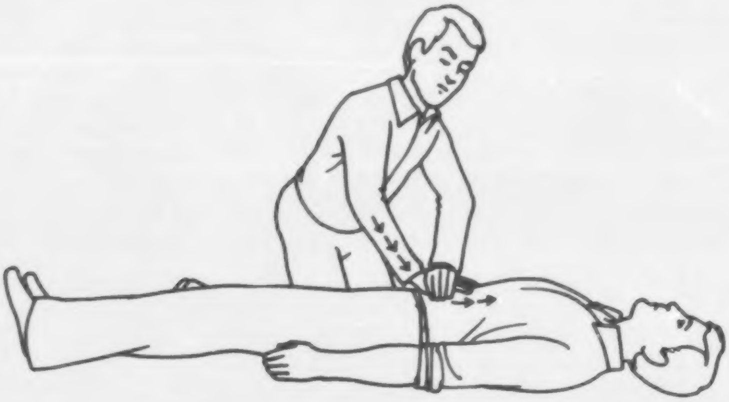

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Figure 4-8.—Position for reclining abdominal thrust.

If unsuccessful, repeat cycles of four backslaps and four abdominal thrusts until the obstruction is dislodged.

Chest Thrusts

For obese or pregnant victims, the chest thrust methods are recommended for removing airway obstructions since manual pressure in the abdomen area of these people would either be ineffective or cause internal damage.

Chest Thrust Standing Technique.—Bring your arms under the arms of the victim, and encircle the lower chest as shown in figure 4-9. Grasp your wrists, keeping the thumbside close to the victim's chest. Keep your fist on the middle of the sternum, not the lower part. Press the chest with sharp, backward thrusts.

Chest Thrust Reclining Technique.—Kneel at either side, place one hand on each side of the chest in line with the armpits, and wrap your fingers around each side of the chest. Give a quick downward thrust with the arms and an inward thrust toward the sternum with the hands (fig. 4-10).

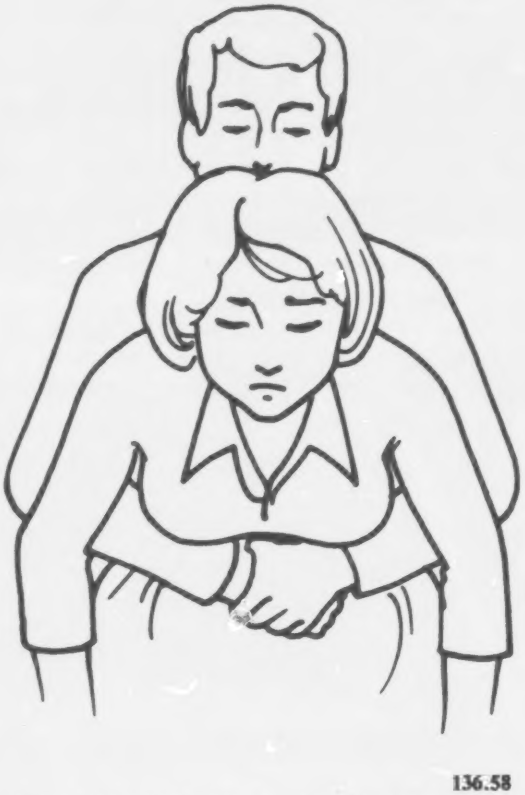

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Figure 4-9.—Position for standing chest thrust.

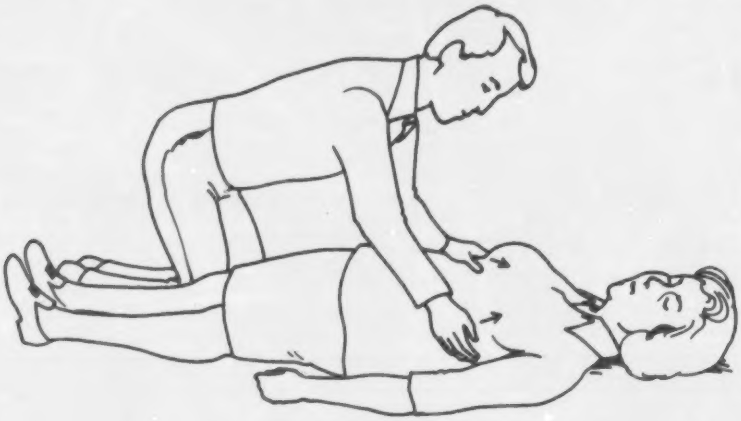

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Figure 4-10.—Position for reclining chest thrust.

If unsuccessful, repeat cycles of four backslaps and four chest thrusts until the obstruction is dislodged.

BREATHING

The second aspect of basic life support is to restore breathing in cases of respiratory arrest. Failure of the breathing mechanism may be caused by various factors. They include complete airway obstruction, insufficient oxygen in the air, the inability of the blood to carry oxygen (carbon monoxide poisoning), paralysis of the breathing center of the brain, and external compression of the body. Breathing failure is usually, but not always, immediately accompanied by cardiac arrest. Periodic checks of the carotid pulse must be made, and be prepared to start CPR.

The signs of respiratory arrest are an absence of respiratory effort, a lack of detectable air movement through the nose or mouth, unconsciousness, and a cyanotic discoloration of the lips and nail beds.

Artificial Ventilation

The purpose of artificial ventilation is to provide a method of air exchange until natural breathing is reestablished. Artificial ventilation should be given only when natural breathing has been suspended; it must not be given to any person who is breathing naturally. Do not assume that a person's breathing has stopped merely because the person is unconscious or has been rescued from the water, from poisonous gas, or from contact with an electric wire. Remember: DO NOT GIVE ARTIFICIAL VENTILATION TO A PERSON WHO IS BREATHING NATURALLY. If the victim does not begin spontaneous breathing after using the head-tilt or jaw-tilt techniques to open the airway, attempt to use artificial ventilation immediately. If ventilation is inadequate, use the backslap/thrust techniques to clear the airway, followed by another attempt at artificial ventilation.

Mouth-to-Mouth

To perform mouth-to-mouth ventilation, place one hand under the victim's neck and place the heel of the other hand on the forehead, using the thumb and index finger to pinch the nostrils shut. Tilt the head back to open the airway. Take a deep breath, cover the victim's mouth with your own, and blow into the victim's mouth. Then remove your mouth from the victim's to allow exhalation. Observe the victim's chest for movement. If there is not sponaneous breathing, start artificial ventilation with four

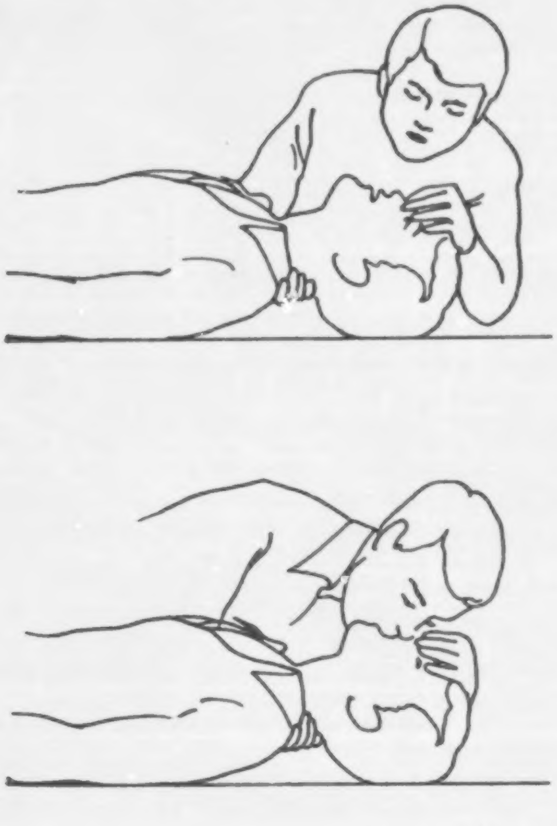

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Figure 4-11.—Mouth to mouth ventilation.

quick ventilations in succession, allowing the lungs to only partially deflate. If the victim still does not respond, then you must fully inflate the lungs at the rate of 12 VENTILATIONS PER MINUTE OR ONE BREATH EVERY 5 SECONDS. See figure 4-11 for proper position. Periodically, check pupils for reaction to light; constriction is a sign of adequate oxygenation. For infants, seal both the mouth and nose with your mouth. Blow small puffs from your cheeks to prevent lung damage. Mouth to mouth ventilation can be administered with a jaw tilt.

Mouth-to-Nose

Mouth-to-nose ventilation is effective when the victim has extensive facial or dental injuries; this permits an effective air seal.

To administer this method, place the heel of one hand on the victim's forehead and use the other hand to lift the jaw. After sealing the victim's lips, take a deep breath, place your lips over the victim's nose and blow. To assist the victim to exhale, you may open the lips. Observe the chest for movement and place your ear next to the victim's nose to listen for, or feel, air exchange. If spontaneous breathing does not occur, start artificial ventilation with four quick breaths in succession, allowing the lungs to only partially deflate. If the victim does not respond, then you must fully inflate the lungs at the rate of 12 ventilations per minute or one breath every 5 seconds until the victim can breathe spontaneously.

Back-Pressure Arm-Lift

The back-pressure arm-lift method is a less effective technique used when other methods are not feasible, such as on a battlefield where gas masks must be worn. Place the victim in the prone position, face to one side, and neck hyperextended with the hands under the head. Quickly clear the mouth of any foreign matter. Kneel at the victim's head and place your hands on the back so that the heels of your hands lie just below a line between the armpits, with thumbs touching and fingers extending downward and outward (fig. 4-12). Rock forward, keeping your arms straight and exert pressure almost directly downward on the victim's back, forcing air out of the lungs. Then rock backward, releasing the pressure and grasping the arms just above the elbows. Continue to rock backward, pulling the arms upward and inward (toward the head) until resistance and tension in the shoulders are noted. This expands the chest causing active intake of air (inspiration). Rock forward and release the victims arms. This causes passive exiting of air (expiration). Repeat the cycle of press, release, lift, and release 12 times a minute until the victim can breathe spontaneously.

Mask-to-Mask

Certain types of gas masks for use in a contaminated environment, such as on a battlefield after a chemical or biological warfare attack, are

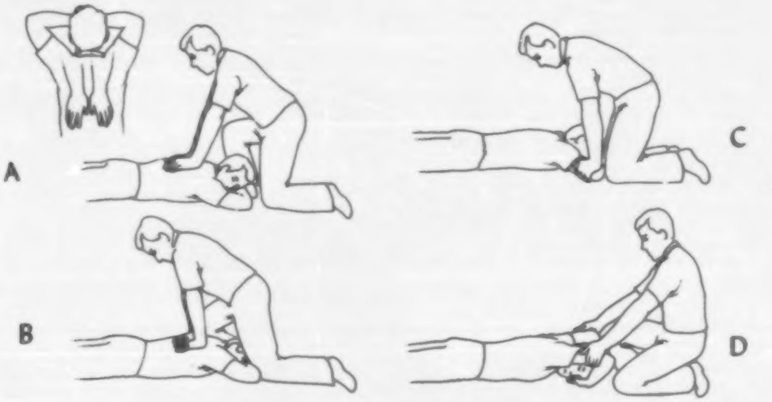

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Figure 4-12.—Back pressure arm lift.

equipped to allow a corpsman to give a victim artificial ventilation without either the corpsman or the patient being exposed to the unhealthy atmosphere. This is carried out by a coupling on the face of each mask. When they are joined, an airway is formed, allowing ventilation to proceed.

Gastric Distention

Sometimes during artificial ventilation air enters the stomach instead of the lungs. This condition is called gastric distention. It can be relieved by moderate pressure exerted with a flat hand between the navel and rib cage. Before applying pressure, turn the victim's head to the side so that the victim does not choke on stomach contents that are often brought up during the process.

Supportive Equipment

As a corpsman you should become familiar with various pieces of supportive equipment that may be available to help you maintain an open airway and restore breathing in emergency situations. They include artificial airways, the bag-valve-mask system, the mouth-to-mask system with the oxygen-inlet valve, and suction.

Use of Oxygen (O_2)

In an emergency first-aid situation, the corpsman will probably have a size E, 650 liter cylinder available. This is fitted with a yoke-style pressure reducing regulator, with gauges to show tank pressure and flow rate (adjustable from 0 to 15 liters per minute). A humidifier can be attached to the flowmeter nipple to help prevent tissue drying caused by the water varpor free oxygen. An oxygen line can be connected from the flowmeter nipple or humidifier to a number of oxygen delivery devices that will be discussed later.

When available, oxygen should be administered, as described below, to cardiac arrest patients and to self-ventilating patients who are unable to inhale enough oxygen to prevent hypoxia (O_2 deficiency). Hypoxia is characterized by tachycardia, nervousness, irritability, and finally cyanosis. It develops in a wide range of situations from poisoning to shock, crushing chest injuries, cerebrospinal accidents, and heart attack.

Oxygen must never be used near open flames since it supports burning. The cylinders must be handled carefully since they are potentially lethal missiles if punctured or broken.

Artificial Airways

The oropharyngeal and nasopharyngeal airways are primarily used to keep the tongue from occluding the airway.

Oropharyngeal Airway.—This airway can be used only on unconscious victims because a conscious person will gag on it. They come in various sizes for different age groups (it is important to choose the correct size for the victim), and they are shaped to rest on the contour of the tongue and extend from the lips to the pharynx.

One method of insertion is to depress the tongue with a tongue blade and slide the airway in. Another method is to insert the airway upside down into the victim's mouth; then rotate it 180° as it slides into the pharynx (figure 4-13).

Nasopharyngeal Airway.—This airway may be used on conscious victims since it is better tolerated because it does not stimulate the tongue. Since they are made of flexible material, they are designed to be lubricated and then gently passed up the nostril and down into the pharynx. If the airway meets an obstruction in one nostril, withdraw it and try to pass it up the other nostril.

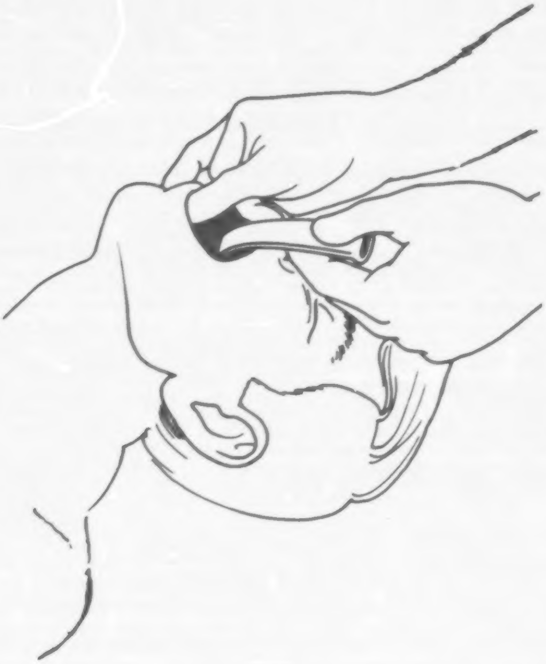

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Figure 4-13.—Placement of an oropharyngeal airway.

Bag-Valve-Mask System

The bag-valve-mask system (fig. 4-14) is designed to help ventilate an unconscious victim for long periods, while delivering high concentrations of oxygen. This system can be useful in extended CPR attempts because when using external cardiac compressions, the cardiac output is cut to 25 to 30 percent of the normal capacity and artificial ventilation does not supply enough O_2 through the circulatory system to maintain life for a long period.

Various types of bag-valve-mask systems that come in both adult and pediatric sizes are in use in the Navy. Essentially, they consist of a self-filling ventilation bag, an O_2 reservoir, plastic face masks of various sizes, and tubing for connection to an O_2 supply.

The bag-valve-mask system is difficult to use if the corpsman has not had a great deal of practice with it. It must not be used by inexperienced persons. The system can be hard to clean and reassemble properly, the bagging hand can tire easily, and an airtight seal at the face is hard to maintain, especially if a single rescuer must also keep the airway open. In addition, the amount of air delivered to the victim is limited to the volume that the hand can displace from the bag (approximately 1 liter per compression).

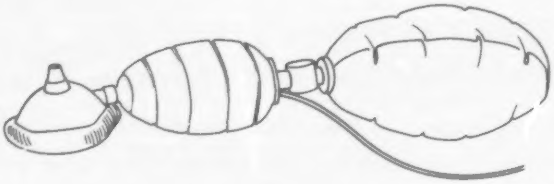

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Figure 4-14.—Bag-valve-mask system.

Technique.—Hook the bag up to an O_2 supply and adjust the flow from 10 to 15 liters per minute (depending on the desired concentration, 15 per minute will deliver an O_2 concentration of 90 percent). After hyperextending the neck to open the airway or inserting an oropharyngeal airway, place the mask over the face and hold it firmly in position with the index finger and thumb, while the remaining fingers keep the jaw tilted upward (fig. 4-15). The other hand is used to compress the bag once every 5 seconds. Observe the chest and abdomen for expansion. If none is observed, the face mask seal may not be airtight, the airway may be blocked, or some component of the bag-valve-mask system may be malfunctioning.

Mouth-to-Mask System

A pocket mask designed for mouth-to-mask ventilation, with an oxygen-inlet flow valve, can be used to give oxygen enriched artificial ventilation. Although this system cannot achieve O_2 concentrations as high as the bag-valve-mask system, it has the advantages of providing greater air volume (up to 4 liters per breath), and being far easier to use since both hands can be used to maintain the airway and keep the mask firmly in place (figure 4-16).

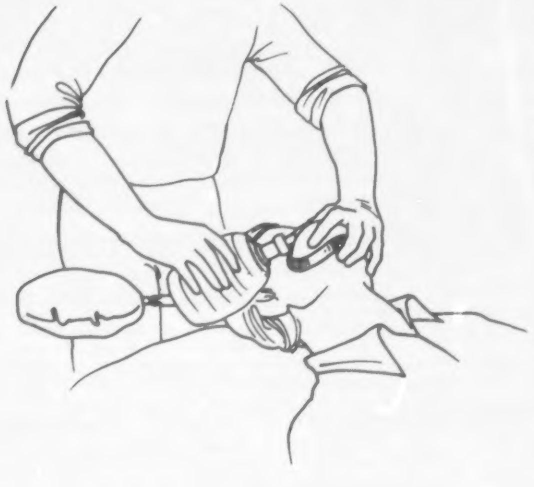

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Figure 4-15.—Bag-valve-mask system in use.

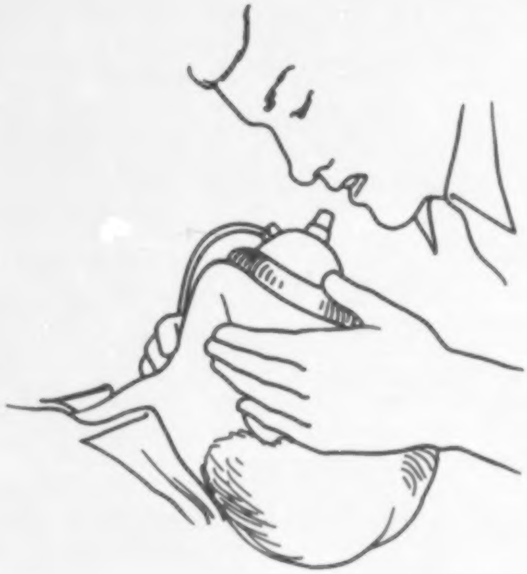

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Figure 4-16.—Mouth to mask breathing.

Technique.—Standing behind the head of the victim, open the airway by tilting the head backward. Place the mask over the victim's face (for adults, the apex goes over the bridge of the nose; for infants, the apex fits over the chin, with the base resting on the bridge of the nose). Form an airtight seal for the mask and keep the airway open by pressing down on the mask with both thumbs while using the other fingers to lift the jaw up and back. The corpsman then ventilates into the open chimney of the mask.

Oxygen can be added by hooking the valve up to an O_2 supply. Since the O_2 flow will be diluted by the rescuer's breath in artificial ventilation, the flow rate will have to be adjusted to increase oxygen concentration. At 5 liters per minute, the O_2 concentration will be approximately 50 percent. At 15 liters per minute, this will increase to 55 percent.

The mask has an elastic strap so it can be used on conscious, self-ventilating patients to increase oxygen concentration.

Suctioning Devices

In a first aid setting, the hospital corpsman may have access to portable or fixed suctioning devices equipped with flexible tubing, semirigid suction tips, suction catheters, and nonbreakable collection bottles. The suction pressure should be tested regularly and the equipment kept clean.

Technique.—After testing the apparatus, attach a catheter or tip, and open the victim's mouth. Carefully insert the end into the pharynx. Apply suction, but for no more than 15 seconds. Suction may be repeated after a few breaths.

CIRCULATION

Cardiac arrest is the complete stoppage of heart function. If the victim is to live, take action immediately to restore heart function. The symptoms include absence of carotid pulse, lack of heartbeat, dilated pupils, and absence of breathing.

A rescuer knowing how to administer cardiopulmonary resuscitation (CPR) greatly increases the chances of a victim's survival. CPR consists of external heart compression and artificial ventilation. This compression is performed on the outside of the chest, and the lungs are ventilated by the mouth-to-mouth or mouth-to-nose techniques. To be effective, CPR must be started within 4 minutes of the onset of cardiac arrest. The victim should be supine on a firm surface.

CPR should not be attempted by a rescuer who has not been properly trained. To learn this technique, see your medical education department or an American Heart Association certified corpsman, nurse, or doctor. If improperly done, CPR can cause serious damage. It must never be practiced on a healthy individual for training purposes; use a training aid instead.

One Rescuer Technique

The rescuer must not assume that an arrest has occurred solely because the victim is lying on the floor and appears to be unconscious. First, try to arouse the victim by gently shaking the shoulders and trying to obtain a response; (loudly ask: "Are you OK?"). If no response, place the victim supine on a firm surface. Kneel at a right angle to the victim, and open the airway using the head tilt or jaw tilt methods described above. Attempt to ventilate. If unsuccessful, reposition the head and again attempt to ventilate. If still unsuccessful, roll the victim on his or her side towards you and deliver four backblows to open the airway. If still unsuccessful, deliver four abdominal or chest thrusts to open the airway. Repeat the backblow/thrust sequence until the obstruction is removed.

Once the airway has been opened: check for responsiveness and breathing, look for chest movement, listen and feel for air escaping from the nose or mouth, and check for the carotid pulse (fig. 4-17). If negative, reposition the victim's mouth and give four quick breaths of air into the victim's lungs while observing the chest to see if it rises. Again check for a carotid pulse and breathing. If negative, locate the sternum.

Use the middle and index fingers of your lower hand to locate the lower margin of the victim's rib cage on the side closest to you. The fingers are then moved up along the edge of the

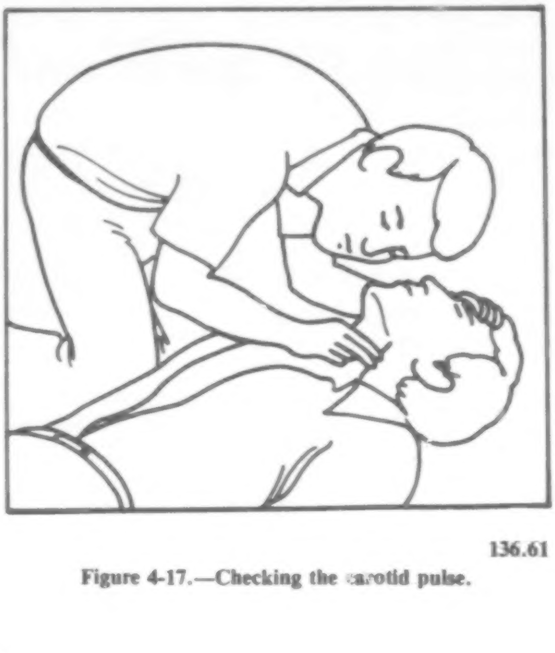

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Figure 4-17.—Checking the carotid pulse.

rib cage to the notch where the ribs meet the sternum in the center of the lower chest. The middle finger is placed on the notch and the index finger is placed next to it. The heel of the other hand is placed along the midline of the sternum next to the index finger. Remember to keep the heel of your hand off of the xiphoid tip of the sternum. A fracture in this area can damage the liver, causing hemorrhage and death.

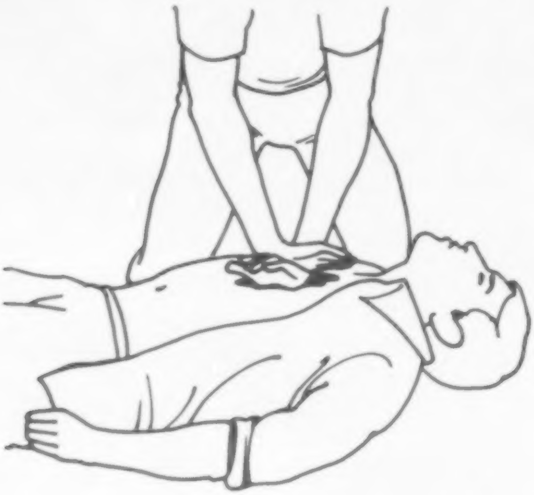

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Figure 4-18.—Position for cardiac compression.

Place the heel of one hand directly on the sternum and the heel of the other on top of the first. See figure 4-18. Interlock your fingers or extend them straight out and **KEEP THEM OFF THE VICTIM'S CHEST!**

Lean or rock forward with the elbows locked and apply vertical pressure to depress the sternum (adult) 1 1/2 to 2 inches. Then release the pressure, keeping the hands in place on the chest.

You will feel less fatigue if you use the proper technique and a more effective compression will result. Ineffective compression occurs when the elbows are not locked, the rescuer is not directly over the sternum, or the hands are improperly placed on the sternum.

When one rescuer performs CPR, as shown in figure 4-19, the ratio of compressions to ventilations is 15 to 2, and it is performed at a rate of 80 compressions per minute to maintain 60 full

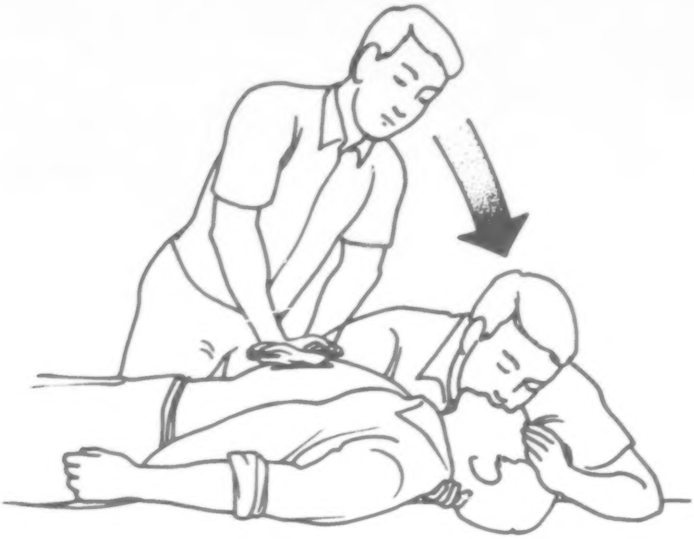

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Figure 4-19.—One rescuer CPR technique.

compressions each minute. Vocalize: "one, and two, and three" until you reach 15. After 15 compressions, you must give the victim two ventilations. Continue for four full cycles. Quickly check for carotid pulse and spontaneous breathing. If there are still no signs of recovery, continue CPR. If a periodic check reveals a return of pulse and respiration, discontinue CPR, but closely monitor the victim and be prepared to start CPR again if required.

Before learning the next technique, review the steps to take in a cardiac arrest involving one rescuer.

1. Determine whether the victim is conscious.

2. Check the vital signs.

3. Ventilate four times (it may be necessary to remove airway obstruction at this time).

4. Again check vital signs; if none, begin the compression-ventilation rate of 15 to 2 for four complete cycles.

5. Check pulse, breathing, and pupils; if no change continue the compression-ventilation rate of 15 to 2 until the victim is responsive, you are properly relieved, or you can no longer continue.

Two Rescuer Technique

If there are two people trained in CPR on the scene, one must perform compression while the other performs ventilations (figure 4-20). The ratio for the two person CPR is 5 compressions to 1 ventilation, at a rate of 60 compressions per minute. One rescuer is positioned at the chest area and the other beside the victim's head. The rescuer should be on opposite sides of the victim to ease position changes when one rescuer gets tired. Changes should be made on cue without interrupting the rhythm.

To help avoid confusion, one rescuer must be designated the leader. The leader must make the preliminary checks of the victim's vital signs and perform the initial four ventilations. The second rescuer will get ready for compression and perform the compressions.

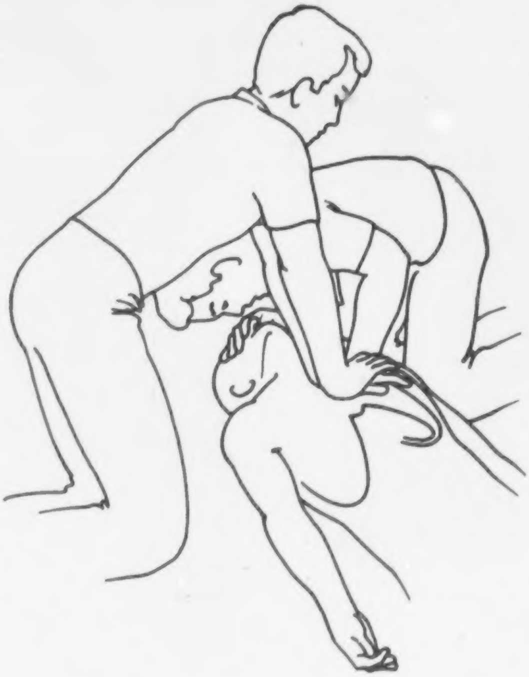

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Figure 4-20.—Two rescuer CPR technique.

When CPR is started, the compressions should be given in a constant, methodical rhythm. The rescuer giving the compressions counts them out loud (one thousand one, one thousand two, etc). As the fifth compression is released, the other rescuer ventilates the victim. Do not stop the compressions while ventilating the victim.

CPR for Children and Infants

Closed chest cardiac massage for children is similar to that for adults. The primary difference is that the heel of only one hand is used to depress the middle of the sternum from three-fourths to one and one-half inches. The other hand can be used to maintain a head tilt that helps ventilation. For infants, only two fingers are used to depress the middle of the sternum from one-half to three-fourths of an inch. For both infants and children, the compression rate increases to 80-100 compressions per minute.

The head-tilt or jaw-tilt methods of ensuring an open airway will cause the upper back of an infant or small child to arch upward. Additional support for the back is provided by a folded towel, sheet, or blanket.

SOFT TISSUE INJURIES

The most common injuries seen by the corpsman in a first aid setting are soft tissue injuries with the accompanying hemorrhage, shock, and danger of infection. Any injury that causes a break in the skin, underlying soft tissue structures, or body membranes is known as a WOUND. This section will discuss the classification of wounds, the general and specific treatment of soft tissue injuries, the use of dressings and bandages in treating wounds, and the special problems that arise because of the location of wounds.

CLASSIFICATION OF WOUNDS

Wounds may be classified according to their general condition, size, location, the manner in which the skin or tissue is broken, and the agent that caused the wound. It is usually necessary for you to consider these factors to determine what first aid treatment is appropriate for the wound.

General Condition of the Wound

If the wound is fresh, first aid treatment consists mainly of stopping the flow of blood, treating for shock, and preventing infection. If the wound is already infected, first aid consists of keeping the victim quiet, elevating the injured part, and applying a warm wet dressing. If the wound contains foreign objects, first aid treatment may consists of removing the objects if they are not deeply embedded. DO NOT remove objects embedded in the eyes or the skull. In addition, if the wound is nonpenetrating, it will be handled in a different manner than a penetrating injury.

Size of the Wound

In general, since large wounds are more serious than small ones, they usually involve more severe bleeding, more damage to the underlying organs or tissues, and a greater degree of shock. However, small wounds are sometimes more dangerous than large ones because they may become infected more readily due to neglect. The depth of the wound is also important because it may lead to a complete perforation of an organ or the body, with the additional complication of entrance and exit wounds.

Location of the Wound

Since a wound may involve serious damage to the deeper structures, as well as to the skin and tissues immediately below it, the location of the wound is important. For example: A knife wound in the chest is likely to puncture a lung and cause interference with breathing. The same type of wound in the abdomen might cause a dangerous infection in the abdominal cavity, or it might actually puncture the intestines, the liver, the kidneys, or the other vital organs. A knife wound to the head might cause brain damage, but the same wound in a less vital spot (such as an arm or a leg) might be less important.

Types of Wounds

When you consider the manner in which the skin or tissue is broken, there are six general kinds of wounds: abrasions, incisions, lacerations, punctures, avulsions, and amputations. Many wounds, of course, are combinations of two or more of these basic types.

ABRASIONS. Abrasions are made when the skin is rubbed or scraped off. Rope burns, floor burns, and skinned knees or elbows are common examples of abrasions. This kind of wound can become infected quite easily because dirt and germs are usually embedded into the tissues.

INCISIONS. Incisions, commonly called CUTS, are wounds made by sharp cutting instruments such as knives, razors, and broken glass. Incisions tend to bleed freely because the blood vessels are cut cleanly and without ragged edges. There is little damage to the surrounding tissues. Of all classes of wounds, incisions are the least likely to become infected, since the free flow of blood washes out many of the microorganisms (germs) that cause infection.

LACERATIONS. These wounds are torn, rather than cut. They have ragged, irregular edges and masses of torn tissue underneath. These wounds are usually made by blunt, rather than sharp objects. A wound made by a dull knife, for instance, is more likely to be a laceration than an incision. Bomb fragments often cause lacerations. Many of the wounds caused by accidents with machinery are lacerations; they are often complicated by crushing of the tissues as well. Lacerations are frequently contaminated with dirt, grease, or other material that is ground into the tissues; they are therefore very likely to become infected.

PUNCTURES. Punctures are caused by objects that penetrate into the tissues while leaving a small surface opening. Wounds made by nails, needles, wire, and bullets are usually punctures. As a rule, small puncture wounds do not bleed freely; however, large puncture wounds may cause severe internal bleeding. The possibility of infection is great in all puncture wounds, especially if the penetrating object has tetanus germs on it. To prevent anaerobic infections, primary closures are not made in the case of puncture wounds

AVULSIONS. An avulsion is the tearing away of tissue from a body part. Bleeding is usually heavy. The torn tissue may be surgically reattached in certain situations. It can be saved for medical evaluation by wrapping in cool, moist toweling and rushing it, along with the victim, to a medical facility.

AMPUTATIONS. A traumatic amputation is the nonsurgical removal of the limb from the body. Bleeding is heavy and requires a tourniquet, which will be discussed later, to stop the flow. Shock is certain to develop in these cases. As with avulsed tissue, wrap the limb in cool, moist toweling and transport it to the hospital with the victim. The limb can often be successfully reattached.

Causes of the Wound

Although it is not always necessary to know what agent or object has caused the wound, it is helpful. Knowing what has caused the wound may give you some idea of the probable size of the wound, its general nature, the extent to which it is likely to become contaminated with foreign matter, and what special dangers must be guarded against. Of special concern in a wartime setting is the velocity of the wound causing missile (bullet/shrapnel). A low velocity missile damages only the tissues it comes in contact with. On the other hand, a high velocity missile can do enormous damage by forcing the tissues and body parts away from the track of the missile with a velocity only slightly less than that of the missile itself. These tissues, especially bone, may become damage-causing missiles themselves, thus accentuating the destructive effects of the missile.

Having classified the wound into one or more of the general categories listed above, the corpsman will have a good idea of the nature and extent of the injury, along with any special complications. This information will aid in the treatment of the victim.

MANAGEMENT OF OPEN SOFT TISSUE INJURY

There are three basic rules to be followed in the treatment of practically all open soft tissue injuries: to control hemorrhage, to treat the victim for shock, and to do whatever you can to prevent infection. These will be discussed, along with the proper application of first-aid materials and other specific first-aid techniques.

Hemorrhage

Hemorrhage is the escape of blood from the vessels of the circulatory system. The average adult body contains about 6 liters of blood. Five hundred milliliters of blood, the amount given by blood donors, can usually be lost without any harmful effect. The loss of 1 liter of blood usually causes shock, but shock may develop if small amounts of blood are lost rapidly, since the circulatory system does not have enough time to compensate adequately. The degree of shock progressively increases as greater amounts of blood escape. Young children, sick people, or the elderly may be especially susceptible to the loss of even small amounts of blood since their internal systems are in such delicate balance.

Identification

Capillary blood is usually brick red in color. If capillaries are cut, the blood oozes out slowly. Blood from the veins is dark red. Venous bleeding is characterized by a steady, even flow. If an artery near the surface is cut, the blood, which is bright red in color, will gush out in spurts that are synchronized with the heartbeats. If the severed artery is deeply buried, however, the bleeding will appear to be a steady stream.

In actual practice, you might find it difficult to decide whether bleeding was venous or arterial, but the distinction is not usually important. The important thing to know is that all bleeding must be controlled as quickly as possible.

External hemorrhage is of greatest importance to the corpsman because it is the most frequently encountered and the easiest to control. It is characterized by a break in the skin and visible bleeding. Internal hemorrhage, which will be discussed later, is far more difficult to recognize and to control.

External Hemorrhage Control by Direct Pressure

The best way to control external bleeding is by applying a compress to the wound and exerting pressure directly to the wound. If direct pressure does not stop the bleeding, pressure can also be applied at an appropriate pressure point. At times, elevation of an extremity is also helpful in controlling hemorrhage. The use of splints in conjunction with direct pressure can be beneficial. In those rare cases where bleeding cannot be controlled by any of these methods, a tourniquet must be used.

A compress is a pad or bolster of folded linen that is placed in direct contact with the wound. It should be large enough to cover the entire area of the wound and to extend at least 1 inch in every direction beyond the edges. If the compress is not large enough, the edges of the wound are almost certain to become contaminated.

In most situations a corpsman will have sterile, prepackaged compresses available. However, emergencies will sometimes arise when they will be impossible to obtain, or the supplies will run out. In such a situation, use the cleanest cloth available. A freshly laundered handkerchief, towel, or shirt may be used. Unfold these materials carefully so that you do not touch the part that goes next to the skin. Always be ready to improvise, but never put materials directly in contact with wounds that are likely to stick to a wound, leave lint, or be difficult to remove.

Bandages are strips or rolls of gauze or other materials that are used for wrapping or binding any part of the body and to hold compresses in place. The types of bandages that are most commonly used are the roller bandage and the triangular bandage which can be used to make the Barton bandage and the cravat bandage.

Roller Bandage

The roller bandage, shown in figure 4-21, consists of a long strip of material (usually gauze, muslin, or elastic) that is wound into a cylindrical shape. Roller bandages come in various widths and lengths. Most of the roller bandages in the first-aid kits have been sterilized, so pieces may be cut off and used as compresses in direct contact with wounds. If you use a piece of roller bandage in this manner, you must be careful not to touch it with your hands or with any other unsterile object.

A piece of roller bandage may be used to make a four-tailed bandage. This is done by splitting the cloth from each end, leaving as large

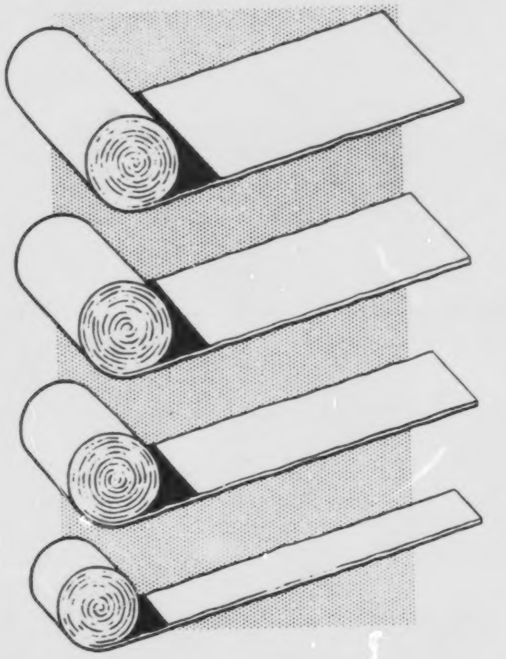

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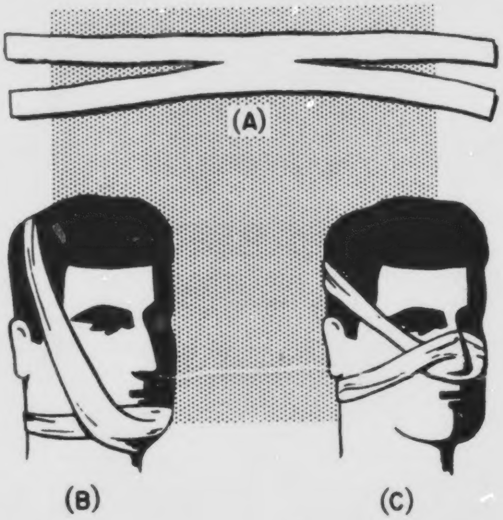
Figure 4-21.—Roller bandages.



(A) Four-tailed bandage. (B) Four-tailed bandage applied to chin. (C) Four-tailed bandage applied to nose.

136.17

Figure 4-22.—Four-tailed bandages.

a center area as necessary. Figure 4-22A shows a bandage of this kind. The four-tailed bandage is often used to hold a compress on the chin, as shown in figure 4-22B, or on the nose, as shown in figure 4-22C. It is good for bandaging any protruding part of the body, because the center portion of the bandage forms a smoothly fitting pocket when the tails are crossed over.

In applying a roller bandage, the roll should be held in the right hand so that the loose end is on the bottom; the outside surface of the loose or initial end is next applied to and held on the body part by the left hand. The roll is then passed around the body part by the right hand, which controls the tension and application of the bandage. Two or three of the initial turns of a roller bandage should overlie each other to secure the bandage and keep it in place (see fig. 4-23).

In applying the turns of the bandage, it is often necessary to transfer the roll from one hand to the other. Bandages should be applied evenly, firmly, but not too tightly. Excessive pressure may cause interference with the circulation and may lead to disastrous consequences. In bandaging an extremity, it is advisable to leave the fingers or toes exposed so the circulation of these parts may be readily observed. It is likewise safer to apply a large number of turns of a bandage, rather than to depend upon a few too firmly applied turns to secure a compress.

In applying a wet bandage, or one that may become wet, it is necessary to allow for shrinkage. The turns of a bandage should completely cover the skin, as any uncovered areas of skin may become pinched between the turns, with resulting discomfort.

In bandaging any exremity, it is advisable to include the whole member (arm or leg, excepting the fingers or toes) so that uniform pressure may be maintained throughout. It is also desirable in bandaging a limb that the part is placed in the position it will occupy when the dressing is

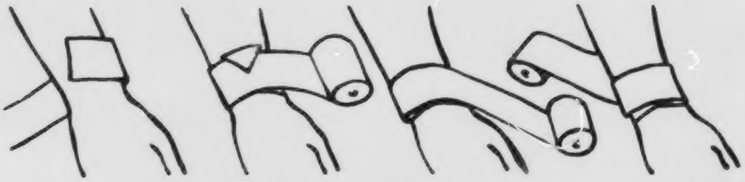


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Figure 4-23.—Applying a roller bandage.

finally completed, as variations in the flexion and extension of the part will cause changes in the pressure of certain parts of the bandage.

The initial turns of a bandage of an extremity (including spica bandages of the hip and shoulder) should be applied securely, and when possible, around the part of the limb that has the smallest circumference. Thus, in bandaging the arm or hand, the initial turns usually are applied around the wrist, and in bandaging the leg or foot, the initial turns are applied immediately above the ankle.

The final turns of a completed bandage usually are secured in the same manner as the initial turns, by employing two or more overlying circular turns. As both edges of the final circular turns are exposed, they should be folded under to present a neat, cufflike appearance. The terminal end of the completed bandage is turned under and secured to the final turns by either a safety pin or adhesive tape. When these are not available, the end of the bandage may be split lengthwise for several inches, and the two resulting tails may be secured around the part by tying.

Roller Bandage For Elbow—A spica or figure-of-eight type of bandage is used around the elbow joint to retain a compress in the elbow region and to allow a certain amount of movement. Flex the elbow slightly, if you can do so without causing further pain or injury, or anchor a 2- or 3-inch bandage above the elbow and encircle the forearm below the elbow with a circular turn. Continue the bandage upward across the hollow of the elbow to the starting point. Make another circular turn around the upper arm, carry it downward, repeating the figure-of-eight procedure, and gradually ascend the arm. Overlap each previous turn about two-thirds of the width of the bandage. Secure the bandage with two circular turns above the elbow and tie. To secure a dressing on the tip of the elbow, reverse the procedure and cross the bandage in the back (fig. 4-24).

Roller Bandage For Hand And Wrist—For the hand and wrist, a figure-of-eight bandage is ideal. Anchor the dressing, whether it is on the hand or wrist, with several turns of a 2- or 3-inch bandage. If on the hand, anchor the dressing with several turns and continue the bandage diagonally upward and around the wrist and back over the palm. Make as many turns as necessary to secure the compress properly (fig. 4-25).

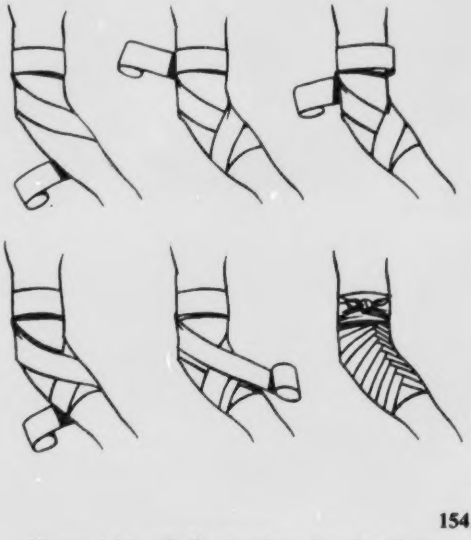

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Figure 4-24.—Roller bandage for the elbow.

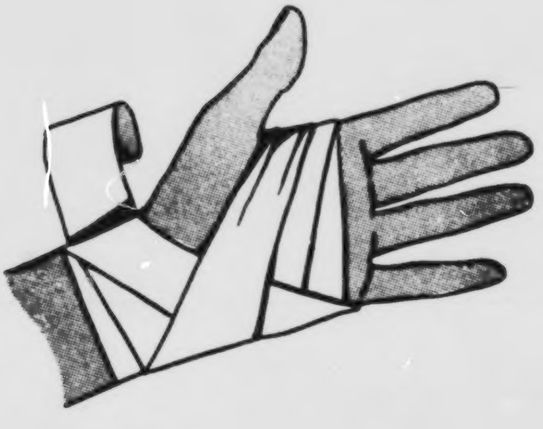

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Figure 4-25.—Roller bandage for the hand and wrist.

Roller Bandage For Ankle And Foot—The figure-of-eight bandage is also used for dressings of the ankle, as well as for supporting a sprain. While keeping the foot at a right angle, start a 3-inch bandage around the instep for several turns to anchor it. Carry the bandage upward over the instep and around behind the ankle, forward and again across the instep and down under the arch, thus completing one figure-of-eight. Continue the figure-of-eight turns, overlapping one-third to one-half its width, with an occasional turn around the ankle, until the compress is secured or until adequate support is obtained (fig. 4-26).

Roller Bandage For Heel—The heel is one of the most difficult parts of the body to bandage. Place the free end of the bandage on the outer part of the ankle and bring the bandage under the foot and up. Then carry the bandage over the instep, around the heel, and back over the instep to the starting point. Overlap the lower border of the first loop around the heel and repeat the turn, overlapping the upper border of the loop around the heel. Continue this procedure until the desired number of turns is obtained, and secure with several turns around the lower leg (fig. 4-27).

Roller Bandage For Arm And Leg—The spiral reverse bandage must be used to cover wounds of the forearms and lower extremities; only such bandages can keep the dressing flat and even. Make two or three circular turns around the lower and smaller part of the limb to anchor the bandage and start upward, going around making the reverse laps on each turning, overlapping about one-third to one-half the width of the previous turn. Continue as long as each turn lies flat. Continue the spiral and secure the end when completed (fig. 4-28).

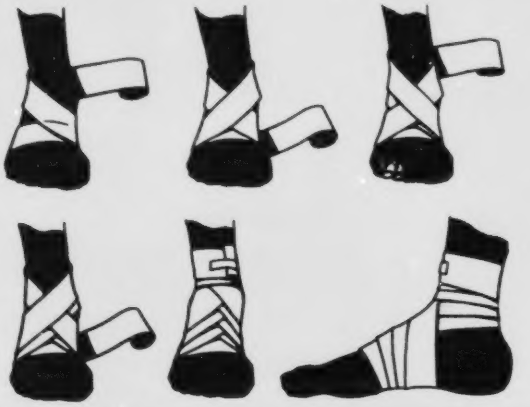

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Figure 4-26.—Roller bandage for the ankle and foot.

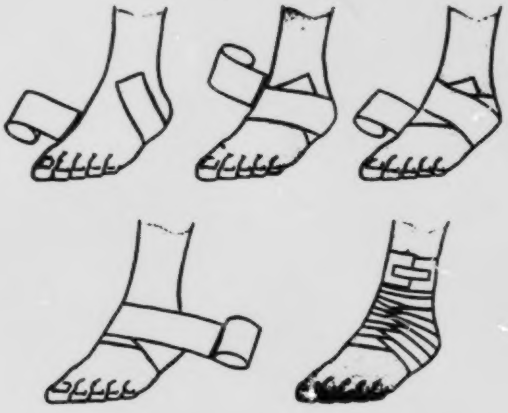

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Figure 4-27.—Roller bandage for the heel.

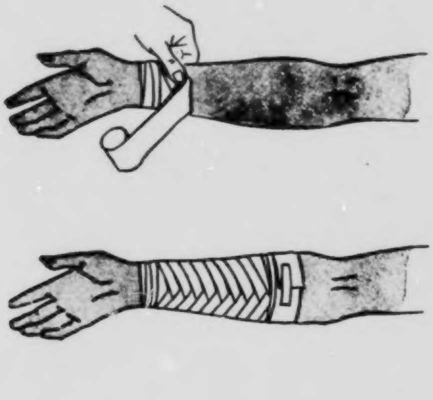

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Figure 4-28.—Roller bandage for the arm or leg.

Triangular Bandage

Triangular bandages are usually made of muslin. They are made by cutting a 36" to 40" square of a piece of cloth and then cutting the square diagonally, thus making two triangular bandages (in sterile packs on the Navy's medical stock list). A smaller bandage may be made by folding a large handkerchief diagonally. The longest side of the triangular bandage is called the base; the corner directly opposite the middle of the base is called the point; and the other two corners are called ends (fig. 4-29).

The triangular bandage is useful because it can be folded in variety of ways to fit almost any part of the body. Padding may be added to areas that may become uncomfortable.

Triangular Bandage Of The Head—This bandage is used to retain compresses on the forehead or scalp. Fold back the base about 2 inches, thus making a hem. Place the middle of the base on the forehead, just above the eyebrows, with the hem on the outside. Let the point fall over the head and down over the occiput (back of the head). Bring the ends of the triangle around the back of the head above the ears, cross them over the point, carry them around the forehead and tie in a SQUARE KNOT. Hold the compress firmly with one hand and, with the other, gently pull down the point until the compress is snug; then bring the point up and tuck it over in the bandage where it crosses the back part of the head (fig. 4-30).

Triangular Bandage For Shoulder—Cut or tear the point, perpendicular to the base, about 10 inches. Tie the two points loosely around the patient's neck, allowing the base to drape down over the compress on the injured side. Fold the base to the desired width, grasp the ends, and fold or roll the sides toward the shoulder to store the excess bandage. Wrap the ends snugly around the upper arm, and tie on the outside surface of the arm (fig. 4-31).

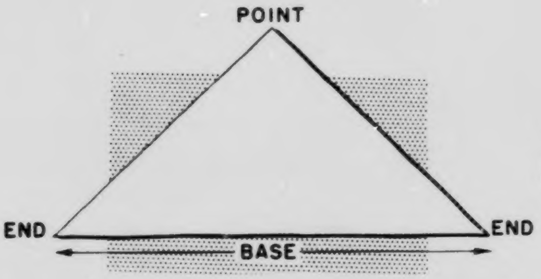

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Figure 4-29.—Triangular bandage.

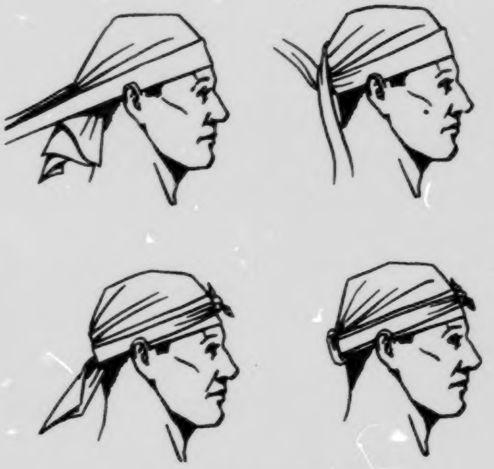

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Figure 4-30.—Triangular bandage for the head.

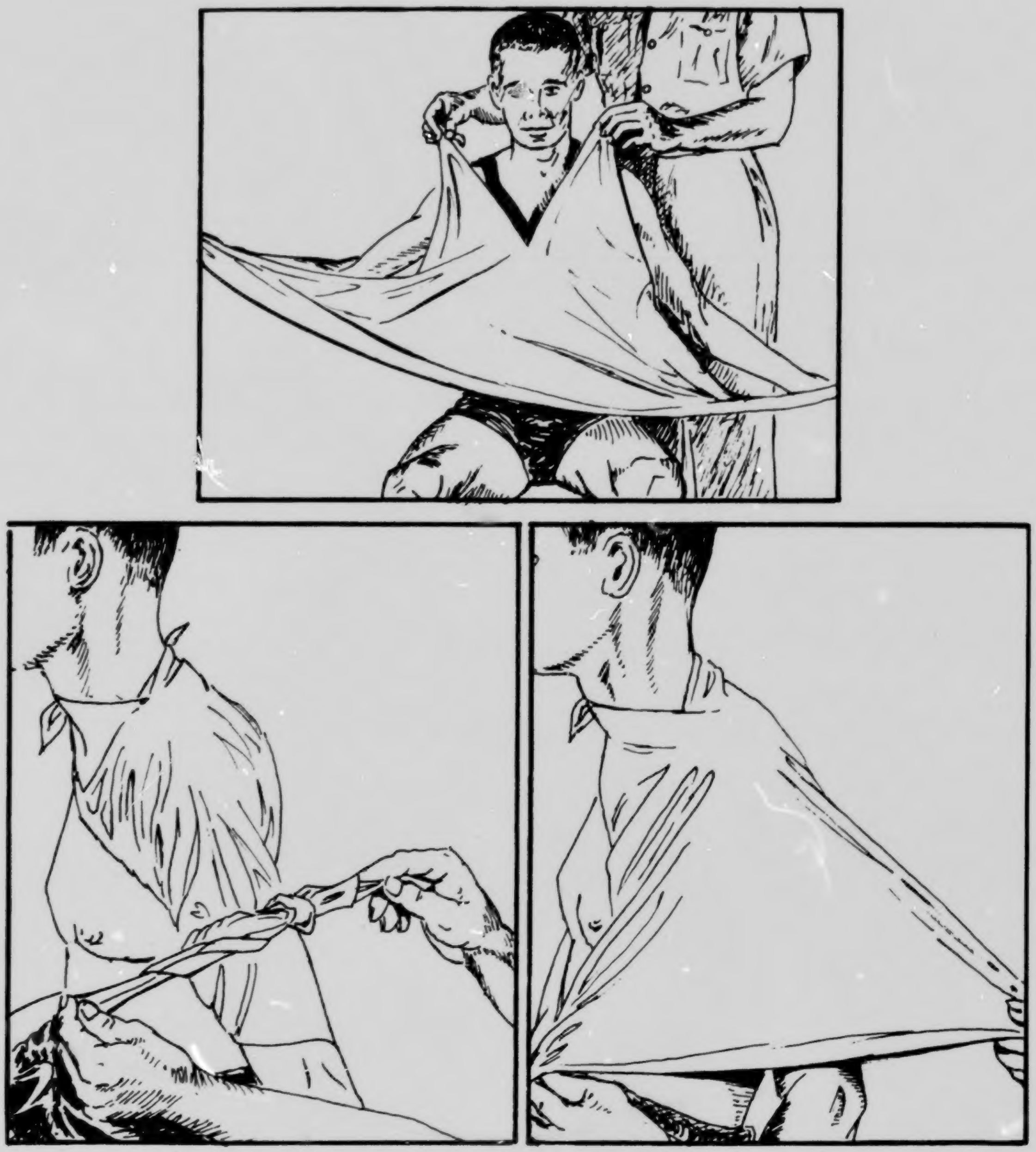

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Figure 4-31.—Triangular bandage for the shoulder.

Triangular Bandage For Chest—Cut or tear the point, perpendicular to the base, about 10 inches. Tie the two points loosely around the patient's neck, allowing the bandage to drape down over the chest. Fold the bandage to the desired width, carry the ends around to the back, and secure by tying (fig. 4-32).

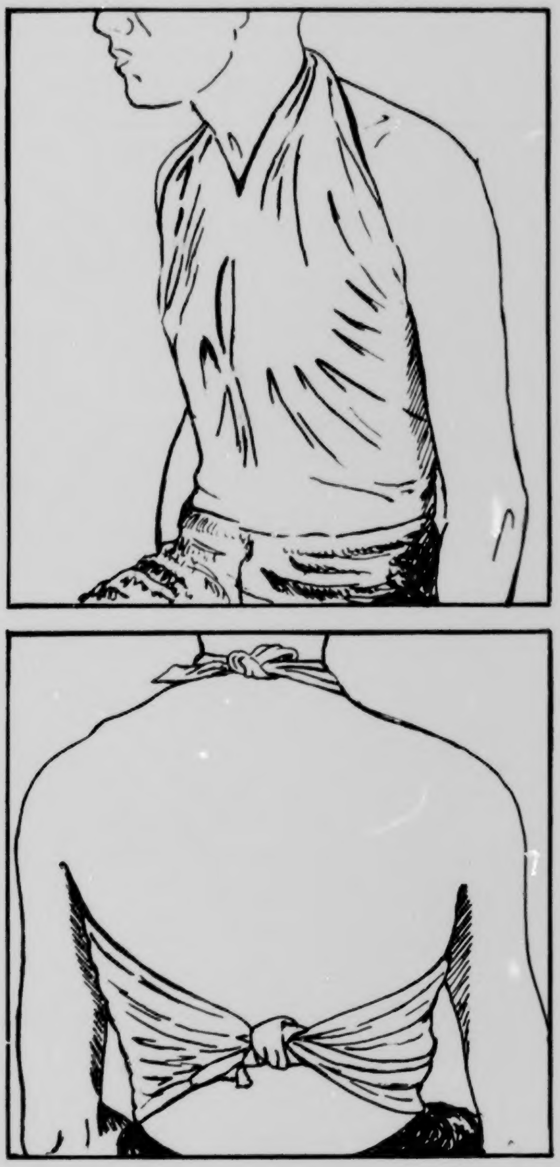

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Figure 4-32.—Triangular bandage for the chest.

Triangular Bandage For Hip Or Buttock—Cut or tear the point, perpendicular to the base, about 10 inches. Tie the two points around the thigh on the injured side. Lift the base up to the waistline, fold to the desired width, grasp the ends, fold or roll the sides to store the excess bandage, carry the ends around the waist, and tie on the opposite side of the body (fig. 4-33).

Triangular Bandage For Side Of Chest—Cut or tear the point, perpendicular to the base, about 10 inches. Place the bandage, points up, under the arm on the injured side. Tie the two points on top of the shoulder. Fold the base to the desired width, carry the ends around the chest, and tie on the opposite side (fig. 4-34).

Triangular Bandage For Foot—This bandage is used to retain large compresses on the foot. After the compresses are applied, place the foot in the center of a triangular bandage and carry the point over the ends of the toes and over the upper side of the foot to the ankle. Fold in excess bandage at the side of the foot, cross the ends, and tie in a square knot in front (fig. 4-35).

Triangular Bandage For Hand—This bandage is used to retain large dressings on the hand. After the dressings are applied, place the base of the triangle well up on the palmar surface of the wrist. Carry the point over the ends of the fingers and back of the hand well up on the wrist. Fold the excess bandage at the side of the hand, cross the ends around the wrist, and tie in a square knot in front (fig. 4-35).

Barton Bandage

With the initial end of the roller bandage applied to the head, just behind the right mastoid process, the bandage is carried under the bony prominence at the back of the head, upward and forward back of the left ear, obliquely across the top of the head, downward in front of the right ear. It is then carried under the chin, upward in front of the left ear, obliquely across the top of the head, crossing the first turn in the midline of

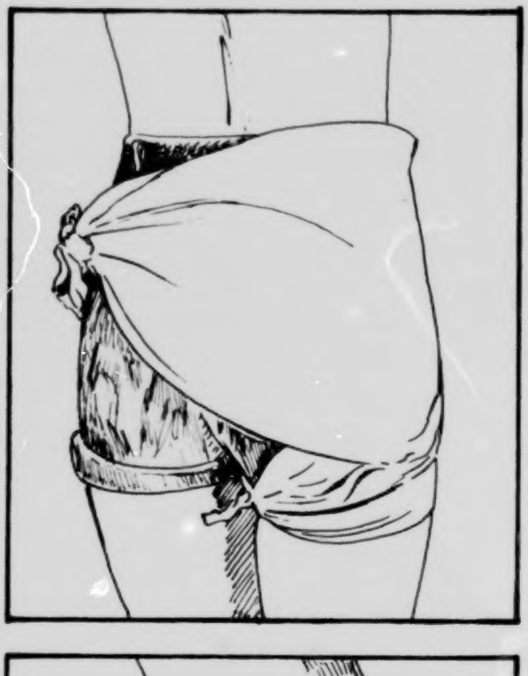

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Figure 4-33.—Triangular bandage for the hip or buttock.

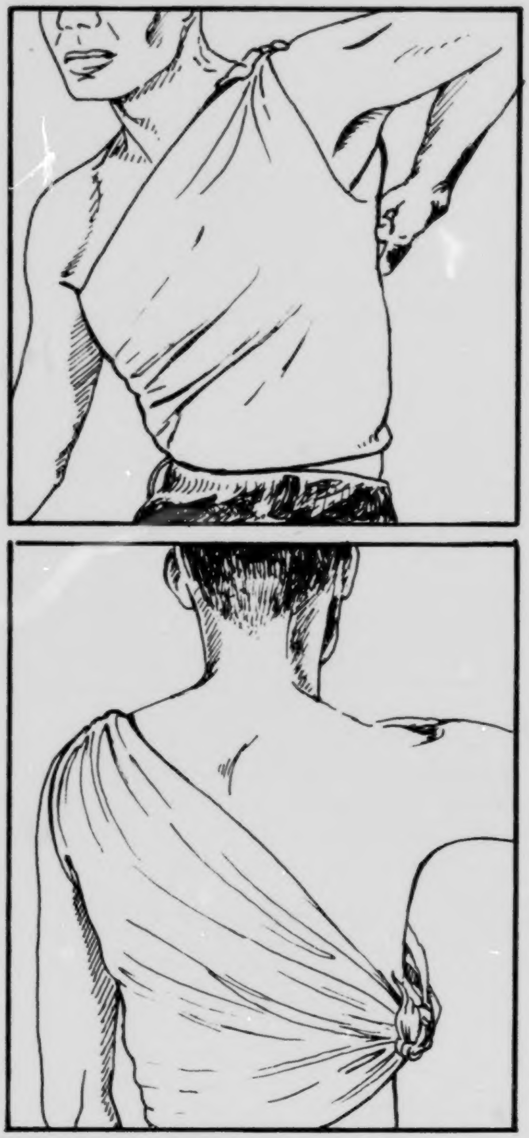

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Figure 4-34.—Triangular bandage for the side of the chest.

the head, and then backward and downward to the point of origin behind the right mastoid. Now it is carried around the back of the head under the left ear, around the front of the chin, and under the right ear to the point of origin.

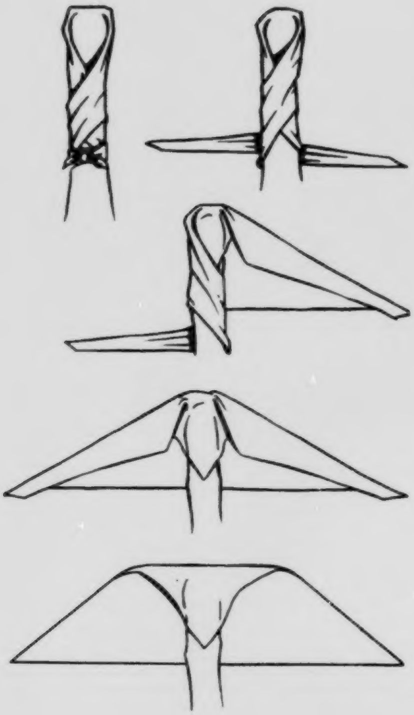

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Figure 4-35.—Triangular bandage for the foot or hand.

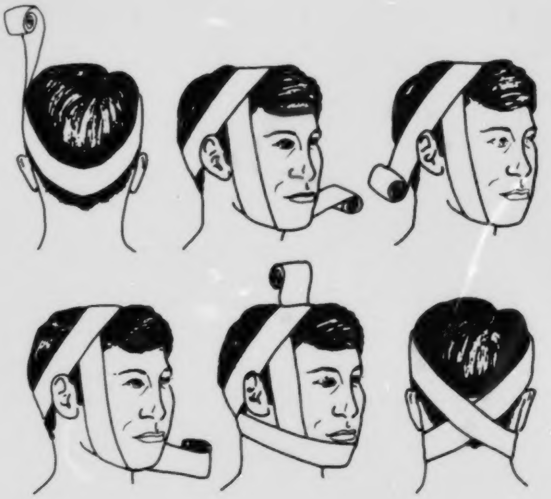

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Figure 4-36.—Barton bandage.

This procedure is repeated several times, each turn exactly overlying the preceding turn. The bandage is secured with a pin or strip of adhesive tape at the crossing on top of the head. It may be used for fractures of the lower jaw and to retain compresses to the chin (fig. 4-36).

Cravat Bandage

To make a cravat bandage, bring the point of the triangular bandage to the middle of the base and continue to fold until a 2 inch width is obtained (fig. 4-37).

Cravat Bandage For Head—This bandage is useful to control bleeding from wounds of the scalp or forehead. After placing the compress over the wound, place the center of the cravat over the compress and carry the ends around to

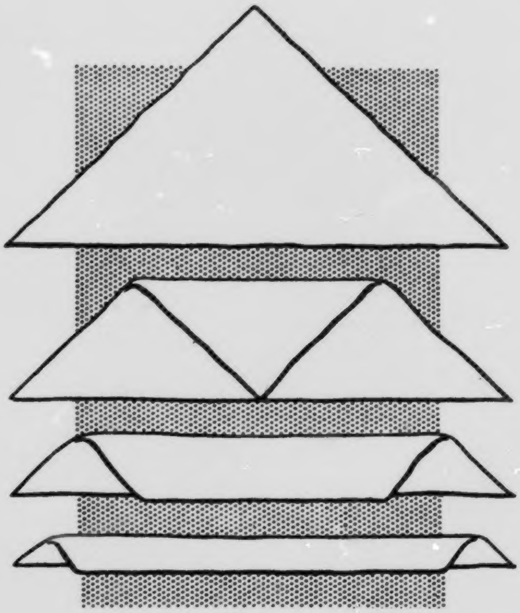

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Figure 4-37.—Cravat bandage.

the opposite side; cross them, continue to carry them around to the starting point, and tie in a square knot.

Cravat Bandage For Eye—After applying a compress to the affected eye, place the center of the cravat over the compress and on a slant so that the lower end is inclined downward. Bring the lower end around under the ear on the opposite side. Cross the ends in back of the head, bring them forward, and tie them over the compress (fig. 4-38).

Cravat Bandage For Temple, Cheek, Or Ear—After the compress is applied to the wound, place the center of the cravat over it and hold one end over the top of the head, carry the other under the jaw and up the opposite side, over the top of the head, and cross them at right angles over the temple on the injured side. Continue one end around over the forehead and the other around the back of the head to meet over the temple on the injured side. Tie the ends in a square knot. This bandage is also called a Modified Barton (fig. 4-39).

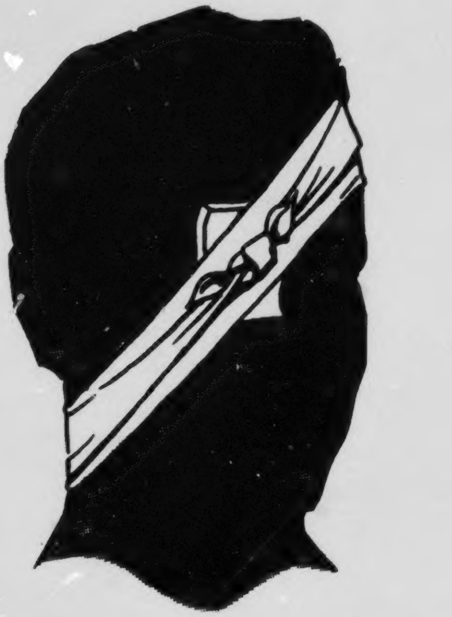

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Figure 4-38.—Cravat bandage for the eye.

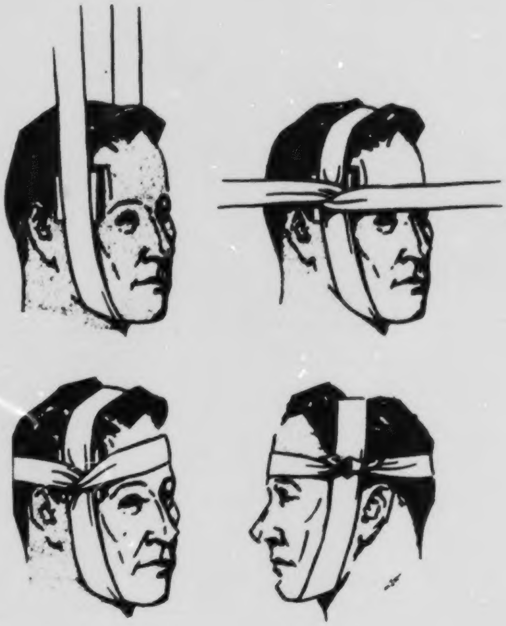

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Figure 4-39.—Cravat bandage for the temple, cheek, or ear.

Cravat Bandage For Elbow Or Knee—After applying the compress, and if the injury or pain is not too severe, bend elbow or knee to a right-angle position before applying the bandage. Place the middle of a rather wide cravat over the point of the elbow or knee, and carry the upper end around the upper part of the elbow or knee, bringing it back to the hollow, and the lower end entirely around the lower part, bringing it back to the hollow. See that the bandage is smooth and fits snug; then tie in a square knot outside of the hollow (fig. 4-40).

Cravat Bandage For Arm Or Leg—The width of the cravat to use will depend upon the extent and area of the injury. For a small area, place the compress over the wound and center the cravat bandage over the compress. Bring the ends around in back, cross them and tie over the

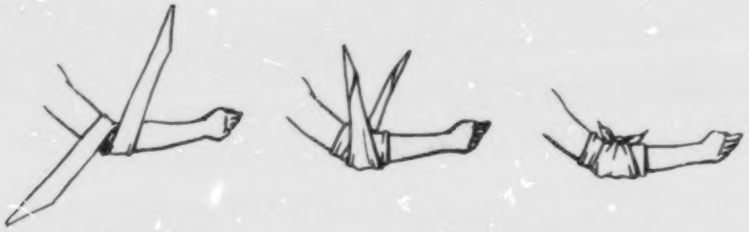

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Figure 4-40.—Cravat bandage for the elbow or knee.

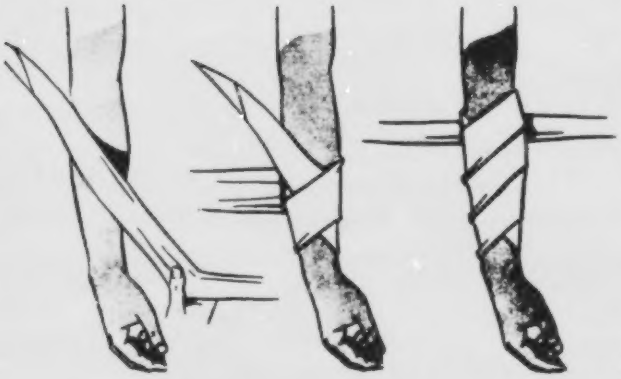

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Figure 4-41.—Cravat bandage for the arm, forearm, leg, or thigh.

compress. For a small extremity it may be necessary to make several turns around to use all the bandage for tying. If the wound covers a larger area, hold one end of the bandage above the compress and wind the other end spirally downward across the compress, until it is secure, then upward and around again, and tie a knot where both ends meet (fig. 4-41).

Cravat Bandage For Axilla (Armpit)—This cravat is used to hold compresses in the axilla. It is similar to the bandage used to control bleeding from the axilla. Place the center of the bandage in the axilla over the compress and carry the ends up over the top of the shoulder and cross them. Continue across the back and chest, to the opposite axilla and tie them. Do not tie too tightly or the axillary artery will be compressed, adversely affecting the circulation of the arm (fig. 4-42).

Battle Dressings

A battle dressing is a combination compress and bandage in which a sterile gauze pad is fastened to a gauze, muslin, or adhesive bandage. Most Navy first aid kits contain both large and small battle dressings of this kind (fig. 4-43).

Any part of a dressing that is to come in direct contact with a wound should be absolutely sterile, that is, it should be free from microorganisms. The dressings that you will find in first aid kits have been sterilized. However, if

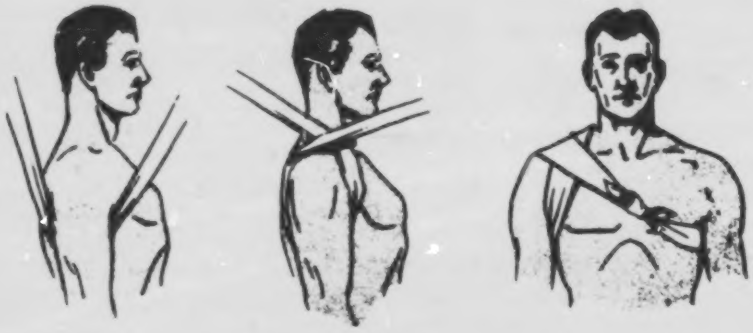

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Figure 4-42.—Cravat bandage for the axilla.

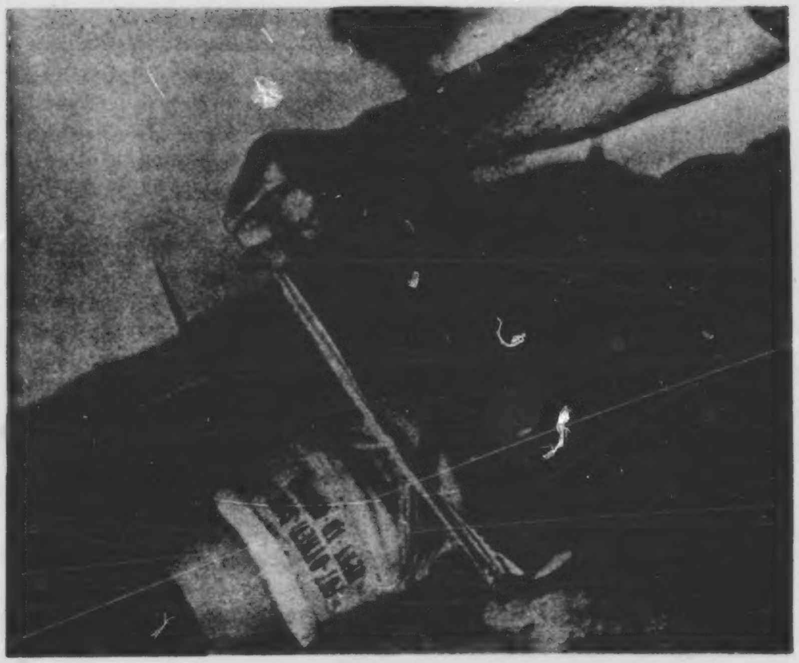

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Figure 4-43.—Battle dressing.

you touch them with your fingers, your clothes, or any other unsterile object, they are no longer sterile. If you drag a dressing across the victim's skin or allow it to slip after it is in place, the dressing is no longer sterile.

If bleeding does not stop after a short period, try placing another compress or dressing over the first and securing it firmly in place. If bleeding still will not stop, try applying direct pressure with your hand over the compress or dressing.

Remember that in cases of severe hemorrhage, do not worry too much about finding appropriate materials or about the dangers of infection. The basic problem is to stop rapid exsanguination. If no material is available, simply thrust your hand into the wound. In most situations direct pressure is the first and best method to use in control of hemorrhage.

Pressure Points

Bleeding can often be temporarily controlled by applying hand pressure to the appropriate pressure point. A pressure point is a place where the main artery to the injured part lies near the skin surface and over a bone. Apply pressure at this point with the fingers (digital pressure) or with the heel of the hand; no first aid materials are required. The object of the pressure is to compress the artery against the bone, thus shutting off the flow of blood from the heart to the wound.

There are 11 principal points on each side of the body where hand or finger pressure can be used to stop hemorrhage. These points are shown in figure 4-44.

If bleeding occurs on the face below the level of the eyes, apply pressure to the point on the mandible. This is shown in figure 4-44A. To find this pressure point, start at the angle of the jaw and run your finger forward along the lower edge of the mandible until you feel a small notch. The pressure point is in this notch.

If bleeding is in the shoulder or in the upper part of the arm, apply pressure with the fingers behind the clavicle. You can press down against the first rib or forward against the clavicle—either kind of pressure will stop the bleeding. This pressure point is shown in figure 4-44B.

Bleeding between the middle and the upper arm and the elbow should be controlled by applying digital pressure in the inner (body) side of the arm, about halfway between the shoulder and the elbow. This compresses the artery against the bone of the arm. The application of pressure at this point is shown in figure 4-44C.

Bleeding from the hand can be controlled by pressure at the wrist, as shown in figure 4-44D. If it is possible to hold the arm up in the air, the bleeding will be relatively easy to stop.

Figure 4-44E shows how to apply digital pressure in the middle of the groin, so as to control bleeding from the thigh. The artery at this point lies over a bone and quite close to the surface, so pressure with your fingers may be sufficient to stop the bleeding.

Figure 4-44F shows the proper position for controlling bleeding from the foot. As in the case of bleeding from the hand, elevation is helpful in controlling the bleeding.

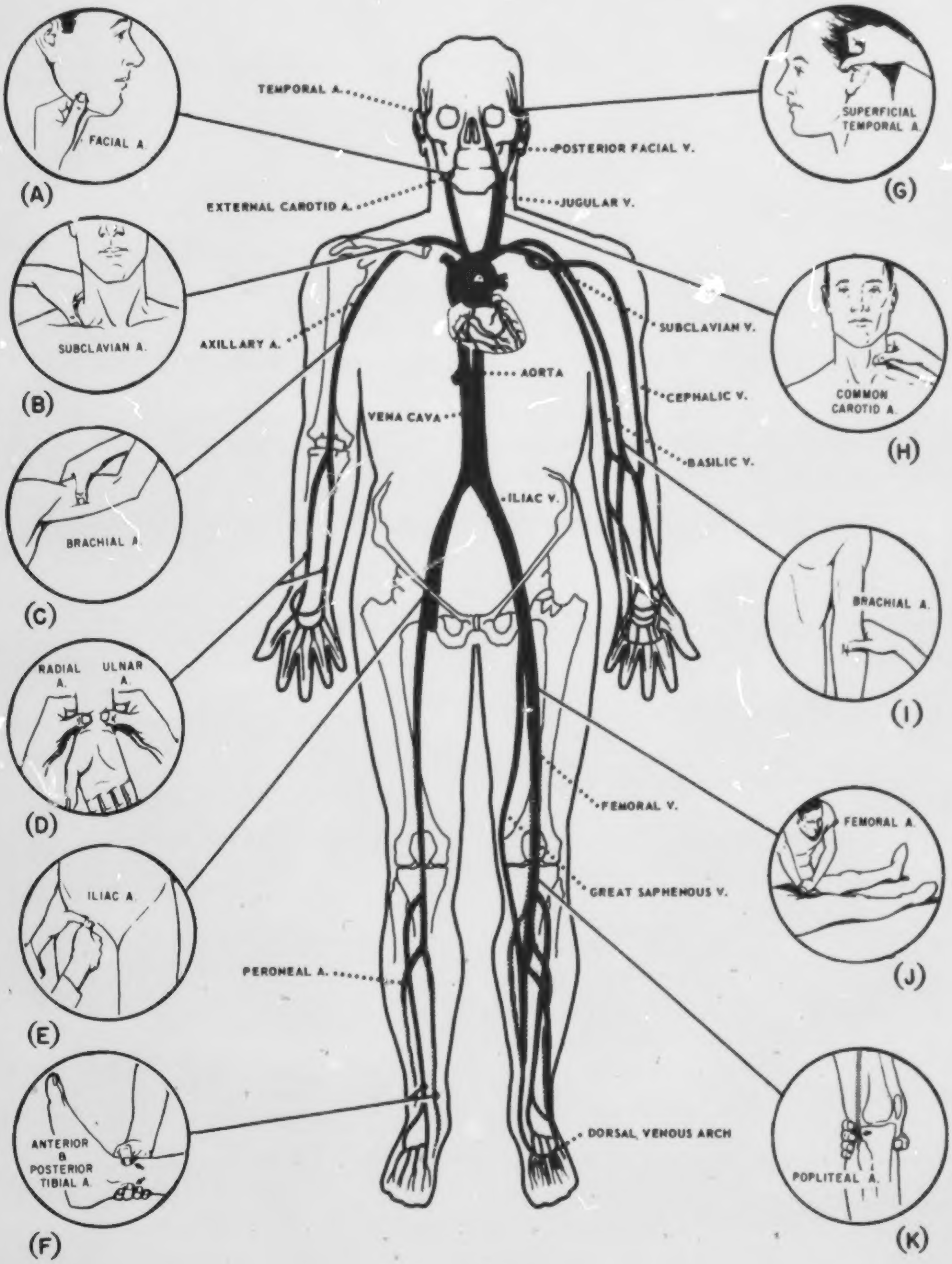
If bleeding is in the region of the temple or the scalp, use your finger to compress the main artery to the temple against the skull bone at the pressure point just in front of the ear. Figure 4-44G shows the proper position.

If the neck is bleeding, apply pressure below the wound, just in front of the prominent neck muscle. Press inward and slightly backward, compressing the main artery of that side of the neck against the bones of the spinal column. The application of pressure at this point is shown in figure 4-44H.

Do not apply pressure at this point unless it is absolutely essential, since there is a great danger of pressing on the windpipe and thus choking the victim.

Bleeding from the lower arm (forearm) can be controlled by applying pressure at the elbow, as shown in figure 4-44I.

As mentioned before, bleeding in the upper part of the thigh can sometimes be controlled by applying digital pressure in the middle of the groin, as shown in figure 4-44E. Sometimes, however, it is more effective to use the pressure point of the upper thigh, as shown in figure 4-44J. If you use this point, apply pressure with the closed fist of one hand and use the other hand to give additional pressure. The artery at this point is deeply buried in some of the heaviest muscle of the body, so a great deal of


FACIAL A.
(A)
SUBCLAVIAN A.
(B)
BRACHIAL A.
(C)
RADIAL A.
ULNAR A.
(D)
ILIAC A.
(E)
ANTERIOR & POSTERIOR TIBIAL A.
(F)
TEMPORAL A.
POSTERIOR FACIAL V.
EXTERNAL CAROTID A.
JUGULAR V.
AXILLARY A.
SUBCLAVIAN V.
AORTA
CEPHALIC V.
VENA CAVA
BASILIC V.
ILIAC V.
FEMORAL V.
GREAT SAPHENOUS V.
PERONEAL A.
DORSAL VENOUS ARCH
SUPERFICIAL TEMPORAL A.
(G)
COMMON CAROTID A.
(H)
BRACHIAL A.
(I)
FEMORAL A.
(J)
POPLITEAL A.
(K)

136.3

Figure 4-44.—Pressure points.

pressure must be exerted to compress the artery against the bone.

Bleeding between the knee and the foot may be controlled by firm pressure at the knee. If pressure at the side of the knee does not stop the bleeding, hold the front of the knee with one hand and thrust your fist hard against the artery behind the knee, as shown in figure 4-44K. If necessary, you can place a folded compress or bandage behind the knee, bend the leg back, and hold it in place by a firm bandage. This is a most effective way on controlling bleeding, but it is so uncomfortable for the victim that it should be used only as a last resort.

You should memorize these pressure points so that you will know immediately which point to use for controlling hemorrhage from a particular part of the body. Remember, the correct pressure point is that which is (1) NEAREST THE WOUND, and (2) BETWEEN THE WOUND AND THE MAIN PART OF THE BODY.

It is very tiring to apply digital pressure, and it can seldom be maintained for more than 15 minutes. Pressure points are recommended for use while direct pressure is being applied to a serious wound by a second rescuer, or after a compress, bandage, or dressing has been applied to the wound, since it will slow the flow of blood to the area, thus giving the direct pressure technique a better chance to stop the hemorrhage. It is also recommended as a stopgap measure until a pressure dressing or a tourniquet can be applied.

Elevation

The elevation of an extremity, where appropriate, can be an effective aid in hemorrhage control when used in conjunction with other methods of control, especially direct pressure. This is because the amount of blood entering the extremity is decreased due to the uphill gravitational effect. Do not elevate an extremity until it is certain that no bones have been broken or until broken bones are properly splinted.

Splints

Another effective method of hemorrhage control in cases of bone fractures is splinting. The immobilization of sharp bone ends reduces further tissue trauma and allows lacerated blood vessels to clot. In addition, the gentle pressure exerted by the splint helps the clotting process by giving additional support to compresses or dressings already in place over open fracture sites.

Later in this chapter we will go into the subject of splinting in greater detail.

Tourniquet

A tourniquet is a constricting band that is used to cut off the supply of blood to an injured limb. A tourniquet should be used only if the control of hemorrhage by other means proves to be difficult or impossible. A tourniquet must always be applied ABOVE the wound, that is, towards the trunk, and it must be applied as close to the wound as practicable.

Basically, a tourniquet consists of a pad, a band, and a device for tightening the band so that the blood vessels will be compressed. It is best to use a pad, compress, or similar pressure object, if one is available. It goes under the band. It must be placed directly over the artery or it will actually decrease the pressure on the artery and thus allow a greater flow of blood. If a tourniquet placed over a pressure object does not stop the bleeding, there is a good chance that the pressure object is in the wrong place. If this occurs, shift the object around until the tourniquet, when tightened, will control the bleeding. Any long flat material may be used as the band. It is important that the band be flat: belts, stockings, flat strips of rubber, or neckerchiefs may be used; but rope, wire, string, or very narrow pieces of cloth should not be used because they cut into the flesh. A short stick may be used to twist the band, thus tightening the tourniquet. Figure 4-45 shows how to apply a tourniquet.

To be effective, a tourniquet must be tight enough to stop the arterial blood flow to the limb, so be sure to draw the tourniquet tight enough to stop the bleeding. However, do not make it any tighter than necessary.

After you have brought the bleeding under control with the tourniquet, apply a sterile compress or dressing to the wound and fasten it in position with a bandage.

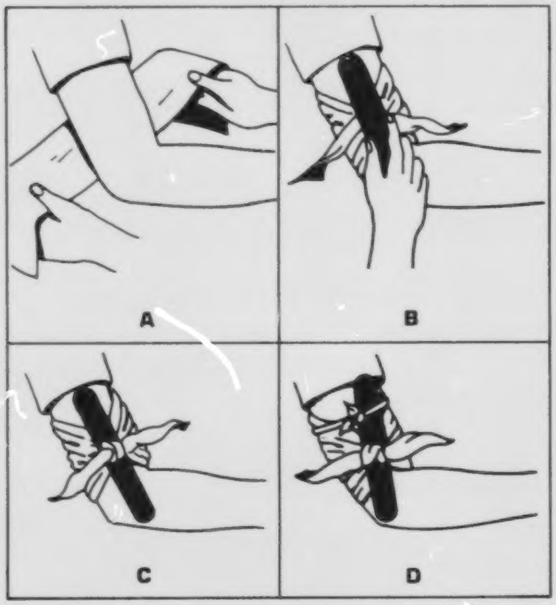


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Figure 4-45.—Applying a tourniquet.

Here are the points to remember about using a tourniquet:

1. Don't use a tourniquet unless you can't control the bleeding by any other means.

2. Don't use a tourniquet for bleeding from the head, face, neck, or trunk. Use it only on the limbs.

3. Always apply a tourniquet ABOVE THE WOUND and as close to the wound as possible.

4. Be sure you draw the tourniquet tight enough to stop the bleeding, but don't make it any tighter than necessary. The pulse beyond the tourniquet should disappear.

5. Don't loosen a tourniquet after it has been applied. Transport the victim to a medical facility that can offer proper care.

6. Don't cover a tourniquet with a dressing. If it is necessary to cover the injured person in some way, MAKE SURE that all the other people concerned with the case know about the tourniquet. Using crayon, skin pencil, or blood, mark a large "T" on the victim's forehead or on a medical tag attached to the wrist.

MANAGEMENT OF INTERNAL SOFT TISSUE INJURY

Internal soft tissue injuries may result from deep wounds, blunt trauma, blast exposure, crushing accidents, bone fracture, poison, or sickness. They may range in seriousness from a simple contusion to a life-threatening hemorrhage and shock.

Visible indications of internal soft tissue injury include the following:

1. Hematemesis—vomiting bright red blood
2. Hemoptysis—coughing up bright red blood
3. Melena—excretion of tarry black stools
4. Hematochezia—excretion of bright red blood from the rectum
5. Hematuria—passing blood in the urine
6. Nonmenstrual vaginal bleeding
7. Epistaxis—nosebleed
8. Pooling of the blood near the skin surface

More often than not, however, there will be no visible signs of injury, and the corpsman will have to infer the probability of internal soft tissue injury from other symptoms that include:

1. Pale, moist, clammy skin.
2. Subnormal temperature.
3. Rapid, feeble pulse.

4. Falling blood pressure.
5. Dilated, slowly reacting pupils with impaired vision.
6. Tinnitus.
7. Syncope.
8. Dehydration and thirst.
9. Air hunger and yawning.
10. Victim will be anxious, with a feeling of impending doom.

There is little that a corpsman can do to correct internal soft tissue injuries since they are almost always surgical problems. The hospital corpsman's goal must be to obtain the greatest benefit from the victim's remaining blood supply. The following should be done.

1. Treat for shock.
2. Keep the victim warm and at rest.
3. Replace lost fluids with a suitable blood volume expander (IV therapy section of the *Nursing Procedures Manual*); DO NOT give the victim anything to drink until the extent of the injury is known for certain.
4. Give oxygen, if available.
5. Splint injured extremities.
6. Apply cold compresses to identifiable injured areas.
7. Transport the victim to a medical facility as soon as possible.

Special Wounds

Animal Bites

A special kind of infection that must be guarded against in case of animal bites is rabies (sometimes called "hydrophobia"). This disease is caused by a virus that is present in the saliva of infected animals. The disease occurs most commonly in wild animals, but it has been found in domestic animals and household pets; in fact, it is probable that all mammals are susceptible to it. The virus that causes rabies is ordinarily transmitted by a bite, but it can be transmitted by the saliva of an infected animal coming in contact with a fresh wound or with the thin mucous membrane of the lips or nose. The virus does not penetrate normal unbroken skin. If skin is broken, DO NOT attempt wound closure.

If rabies develops in man, it is usually fatal. A preventive treatment is available that is very effective if it is started shortly after the bite; this treatment is outlined in the BUMEDINST 6220.6 series. Since the vaccine can be obtained only at a medical facility or a major ship, any person bitten by an animal MUST be transferred quickly to the nearest treatment facility for evaluation, along with a complete report of the circumstances surrounding the incident. Remember, prevention is of utmost importance.

Immediate local treatment of the wound should be given. Wash the wound and the surrounding area carefully, using sterile gauze, soap, and sterile water. Use sterile gauze to dry the wound, and then cover the wound with a sterile dressing. DO NOT use any chemical disinfectant. Do not attempt to cauterize the wound in any way.

All of the animal's saliva must be removed from the victim's skin to prevent further contamination of the wound. (CAUTION: DO NOT allow the animal's saliva to come in contact with open sores or cuts on your hands.)

When a person has been bitten by an animal, every effort must be made to catch the animal to keep it confined for a minimum of 8-10 days. DO NOT kill it if there is any possible chance of catching it alive. The symptoms of rabies are not always present in the animal at the time the bite occurs, but the saliva may nevertheless contain the rabies virus. It is essential, therefore, that the animal is kept under observation until a diagnosis can be made. The rabies treatment is given if the animal develops any definite symptoms, if it dies during the observation period, or if for any reason the animal cannot be kept under observation.

Remember that any animal bite is dangerous and MUST be evaluated at a treatment facility.

SPECIAL CONSIDERATIONS IN WOUND TREATMENT

Shock

Shock is likely to be severe in a person who has lost a large amount of blood or suffered any serious wound. The causes and treatment of shock are explained elsewhere in this chapter.

Infection

Although infection may occur in any wound, it is a particular danger in wounds that do not bleed freely; wounds in which torn tissue or skin falls back into place and prevents the entrance of air; and wounds that involve the crushing of tissues. Incisions, in which there is a free flow of blood and relatively little crushing of tissues, are the least likely to become infected.

Battle wounds are especially likely to become infected. They present the problem of devitalized tissue, extravasated blood, foreign bodies such as missile fragments, bits of cloth, dirt, dust, and a variety of bacteria. The devitalized tissue proteins and extravasated blood provide a nutritional medium for the support of bacterial growth and thus are conducive to the development of serious wound infection. Puncture wounds are also likely to become infected by the germs causing tetanus.

There are two types of bacteria commonly causing infection in wounds—aerobic and anaerobic. The former bacteria live and multiply in the presence of air or free oxygen, while the latter are bacteria that live and multiply only in the absence of air.

The principal aerobic bacteria that cause infection, inflammation, and septicemia (blood poisoning) are streptococci and staphylococci, some varieties of which are hemolytic (destroy red blood cells). The staphylococci and the streptococci may be introduced at the time of infliction, or they may be introduced to the wound later, at the time of first aid treatment or in the hospital when, through carelessness, nonsterile instruments or dressings are employed.

Wash minor wounds immediately with soap and clean water; then dry and paint them with a mild, non irritating antiseptic. Apply a dressing if necessary. In the first aid environment, do not attempt to wash or clean a large wound, and do not apply an antiseptic to it, since it must be cleaned throughly at a medical facility. Simply protect it with a large compress or dressing and transport the victim to a medical facility. After an initial soap and water cleanup, puncture wounds must also be directed to a medical facility for evaluation.

Inflammation

Inflammation is a local reaction to irritation. It occurs in tissue that is injured, but not destroyed. Symptoms include redness, pain, heat, swelling, and sometimes loss of motion.

The body's physiological response to the irritation is to dilate local blood vessels, which increases the blood supply to the area, which in turn causes the skin to appear red and warmer. As the blood vessels dilate, their injured walls leak blood serum into surrounding tissues, causing edema and pain from increased pressure on nerve endings. In addition, white blood cells increase in the area and act as scavengers (phagocytes) in destroying bacteria and ingesting small particles of dead tissue and foreign matter.

This inflammation may be caused by trauma or mechanical irritation; chemical reaction to venom, poison ivy, acids, or alkalies; heat or cold injuries; microorganism penetration; or other agents such as electricity or solar radiation.

Inflammation should be treated by the following:

1. Remove the irritating cause.

2. Keep the inflamed area at rest and elevated.

3. Apply cold for 24-48 hours to reduce swelling. Once swelling is reduced apply heat to soft tissues, which hastens the removal of the products of inflammation.

4. Apply wet dressings and ointments to soften tissues and rid the area of the specific causal bacteria.

Abscesses

An abscess is a localized collection of pus that forms in cavities created by the disintegration of tissue. They may follow injury, illness, or irritation. Most are caused by staphylococcal infections and may occur in any area of the body, but are usually on the skin surface.

A furuncle (boil) is an abscess in the true skin caused by the entry of microorganisms through a hair follicle or sweat gland. A carbuncle is an abscess that has multiple sloughs that are often interconnected under the true skin. When localized there are several "heads." Symptoms begin with localized itching and inflammation, followed by swelling, fever, and pain. Redness and swelling localize and become hard and painful. Pus forms into a cavity, causing the skin to become taut and discolored.

Treatment for furuncles and carbuncles include the following:

1. DO NOT squeeze; this may damage surrounding healthy tissue and spead infection.

2. Use aseptic techniques when handling.

3. Relieve pain with aspirin.

4. Apply moist hot soaks/dressings (110 degrees) for 40 minutes, 3-4 times per day.

5. Rest and elevate the infected body part.

6. An antibiotic therapy may be ordered by a physician.

7. Abscesses should be incised after they have localized (except on the face) to establish drainage. Abscesses in the facial triangle (nose and upper lip) should be seen by a M.O.

EYE WOUNDS

Many eye wounds contain foreign objects. Dirt, coal, cinders, eyelashes, bits of metal, and a variety of other objects may become lodged in the eye. Since even a small piece of dirt is intensely irritating to the eye, the removal of such objects is important. However, the eye is easily damaged. Impairment of vision (or even total loss of vision) can result from fumbling, inexpert attempt to remove foreign objects from the eye. The following precautions MUST be observed:

1. DO NOT allow the victim to rub the eye.

2. DO NOT press against the eye or manipulate it in any way that might cause the object to become embedded in the tissues of the eye. Be very gentle; roughness is almost sure to cause injury to the eye.

3. DO NOT use such things as knives, toothpicks, matchsticks, or wires, to remove the object.

4. DO NOT UNDER ANY CIRCUMSTANCES ATTEMPT TO REMOVE AN OBJECT THAT IS EMBEDDED IN THE EYEBALL OR THAT HAS PENETRATED THE EYE! If you see a splinter or other object sticking out from the eyeball, leave it alone! Only specially trained medical personnel can hope to save the victim's sight if an object has actually penetrated the eyeball.

Small objects that are lodged on the surface of the eye or on the membrane lining the eyelids can usually be removed by the following procedures:

1. Try to wash the eye gently with lukewarm, sterile water. A sterile medicine dropper or a sterile syringe can be used for this purpose. Have the victim lie down, with the head turned slightly to one side as shown in figure 4-46. Hold the eyelids apart. Direct the flow of water to the INSIDE corner of the eye, and let it run down to the OUTSIDE corner. Do not let the water fall directly onto the eyeball.

2. Gently pull the lower lid down, and instruct the victim to look up. If you can see the object, try to remove it with the corner of a clean handkerchief or with a small moist cotton swab. You can make the swab by twisting cotton around a wood applicator, not too tightly, and

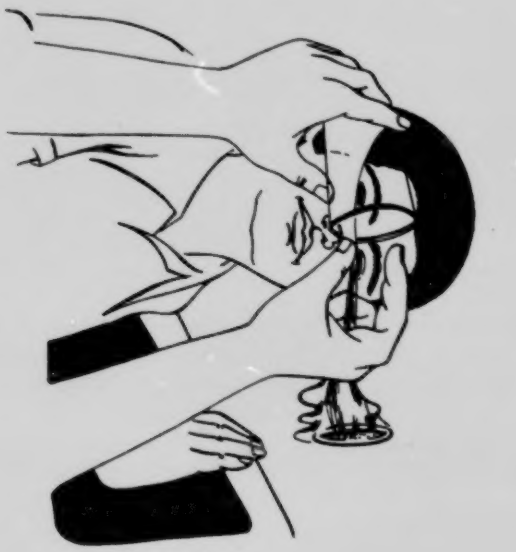

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Figure 4-46.—Irrigating the eye.

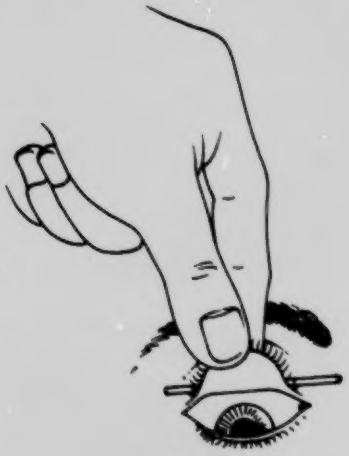

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Figure 4-47.—Turning the upper eyelid.

moistening it with sterile water. CAUTION: Never use DRY cotton anywhere near the eye. It will stick to the eyeball or to the inside of the lids, and you will have the problem of removing it, as well as the original object.

3. If you cannot see the object when the lower lid is pulled down, turn the upper lid back over a smooth wooden applicator, as shown in figure 4-47. Tell the victim to look down. Place the applicator lengthwise across the center of the upper lid. Grasp the lashes of the upper lid gently but firmly. Press gently with the applicator. Pull up on the eyelashes, turning the lid back over the applicator. If you can see the object, try to remove it with a moist cotton swab or with the corner of a clean handkerchief.

4. If the foreign object cannot be removed by any of the above methods, YOU MUST NOT MAKE ANY FURTHER ATTEMPTS TO REMOVE IT. Instead, place a small, thick gauze dressing over both eyes and hold it in place with a LOOSE bandage. This limits movement of the injured eye.

5. Get medical help for the victim at the earliest opportunity.

Head Wounds

Head wounds must be treated with particular care, since there is always the possibility of brain damage. The general treatment for head wounds is the same as that for other fresh wounds. However, certain special precautions must be observed if you are giving first aid to a person who has suffered a head wound.

1. NEVER GIVE ANY MEDICINE.

2. Keep the victim lying flat, with the head at the level of the body. Do not raise the feet if the face is flushed. If the victim is having trouble breathing, you may raise the head slightly.

3. If the wound is at the back of the head, turn the victim on his or her side.

4. Watch closely for vomiting and position the head to avoid aspiration of vomitus or saliva into the lungs.

5. Do not use direct pressure to control hemorrhage if the skull is depressed or obviously fractured.

Facial Wounds

Wounds of the face are treated, in general, like other fresh wounds. However, in all facial injuries make sure the tongue or injured soft tissue does not block the airway, causing a breathing obstruction. Keep the nose and throat clear of any obstructing materials and position the victim so that blood will drain out of the mouth and nose.

Facial wounds that involve the eyelids or the soft tissues around the eye must be handled carefully to avoid further damage. If the injury does not involve the eyeball, apply a sterile compress and hold it in place with a FIRM bandage. If the eyeball appears to be injured, use a LOOSE bandage. (Remember that you must NEVER attempt to remove any object that is embedded in the eyeball or that has penetrated it; just apply a dry sterile compress to cover both eyes and hold it in place with a LOOSE BANDAGE.)

Any person who has suffered a facial wound that involves the eye, the eyelids, or the tissues around the eye must receive medical attention as soon as possible. Be sure to keep the victim lying down; a stretcher must be used for transport.

Chest Wounds

All chest injuries must be considered as serious conditions, for chest injuries may cause severe breathing and bleeding problems. Any victim showing signs of difficulty in breathing without signs of airway obstruction must be inspected for chest injuries. The most serious chest injury that requires immediate first aid treatment is the SUCKING CHEST WOUND. This is a penetrating injury to the chest that produces a hole in the chest cavity, causing the lung to collapse, which prevents normal breathing functions. This is an extremely serious condition that will resut in death if not treated quickly.

Victims with open chest wounds gasp for breath, have difficulty breathing out, and may have a bluish skin color on their face. A frothy looking blood may bubble from the wound during breathing.

The proper treatment for a sucking chest wound is as follows:

1. Immediately seal the wound with a hand or any airtight material available (e.g., ID card). The material must be large enough so that it cannot be sucked into the wound when the victim breathes in.
2. Now firmly tape the material in place with strips of adhesive tape and secure it with a pressure dressing. It is important that the dressing is airtight, otherwise, it will not relieve the victim's breathing problems. The object of the dressing is to keep air from going in and out through the wound.
3. Give the victim oxygen if it is available and you know how to use it.
4. Place the victim in a Fowler's or semi-Fowler's position. This makes breathing a little easier. During combat lay the victim on a stretcher on the affected side.
5. Watch the victim closely for signs of shock and treat accordingly.
6. Do not give victims with chest injuries anything to drink.
7. Transport the victim to a medical facility immediately.

Abdominal Wounds

A deep wound in the abdomen is likely to constitute a major emergency, since there are many vital organs in this area. Abdominal wounds usually cause intense pain, nausea and vomiting, spasm of the abdominal muscles, and severe shock. Immediate surgical treatment is almost always required; therefore, the victim must receive medical attention at once, or the chances of survival will be poor. Give only the most essential first aid treatment and concentrate your efforts on getting the victim to a medical facility. The following first aid procedures may be of help to a person suffering from an abdominal wound:

1. Keep the victim in a supine position. If the intestine is protruding or exposed, the victim may be more comfortable with the knees drawn up; place a coat, a pillow, or some other bulky cloth material under the knees to help maintain this position. DO NOT ATTEMPT TO PUSH THE INTESTINE BACK IN OR TO MANIPULATE IT IN ANY WAY!
2. If bleeding is severe, try to stop it by applying direct pressure.

3. Cover the wound with a dry, sterile dressing, if the intestine is not exposed. If the intestine is exposed, apply a sterile compress moistened with sterile water. If no sterile water is available, clean seawater or any water that is fit to drink may be used to moisten the compress. Figure 4-48 shows an abdominal wound with the intestine protruding. Figure 4-49 shows the application of compresses large enough to cover the wound and the surrounding area. The

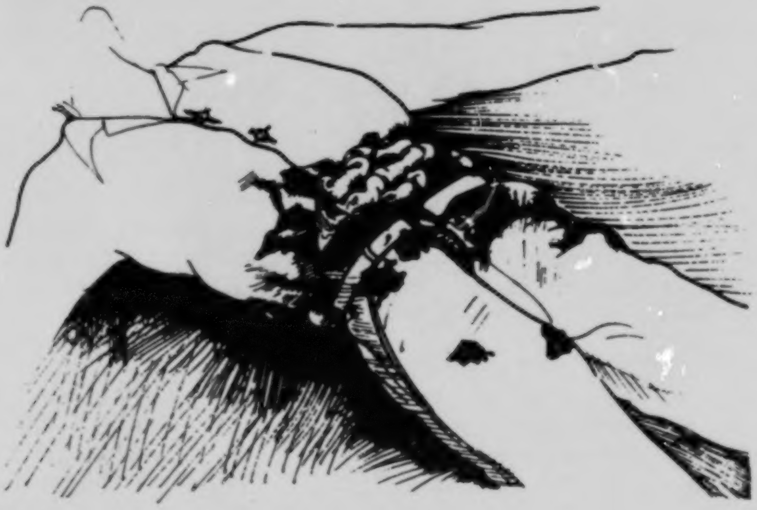

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Figure 4-48.—Protruding abdominal wounds.

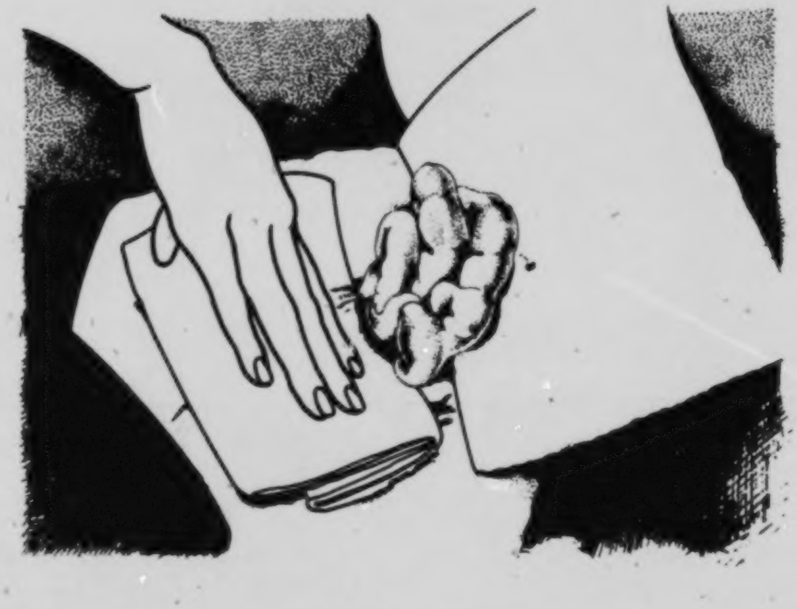

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Figure 4-49.—Applying compresses to a protruding abdominal wound.

compress should be held in place by a bandage. Fasten the bandage firmly so that the compress will not slip around, but do not apply any more pressure than is necessary to hold the compress in position. Large battle dressings are ideal.

4. Treat for shock, but don't waste any time doing it. The victim must be transported to a hospital at the earliest possible opportunity. However, you can minimize the severity of shock by making sure the victim is comfortably warm and kept in the supine positions. DO NOT GIVE ANYTHING TO DRINK. If great thirst exists, moisten the mouth with a small amount of water but do not allow any liquid to be swallowed.

5. Upon the direction of a medical officer, start an IV.

REMOVING FOREIGN OBJECTS

Many wounds contain foreign objects. Wood or glass splinters, bullets, metal fragments, bits of wire, fishhooks, nails, tacks, cinders, and small particles from grinding wheels are examples of the variety of objects or materials that are sometimes found in wounds. In some cases, first aid treatment for wounds includes the removal of such objects when they are near the surface and exposed. However, first aid treatment does not include the removal of deeply embedded objects, powdered glass, or any widely scattered material of this nature. You should never attempt to remove bullets, but you should try to find out whether the bullet remains in the victim; look for both entrance and exit wounds. The general rule to remember is this: Remove foreign objects from a wound when you can do so easily and without causing further damage; but NEVER HUNT FOR OR ATTEMPT TO REMOVE DEEPLY BURIED OR WIDELY SCATTERED OBJECTS OR MATERIALS except in a definitive care environment.

The following procedure may be used to remove a small object from the skin or tissues if the object is near the surface and clearly visible:

1. Cleanse the skin around the object with soap and water and paint with any available skin antiseptic solution.

2. If necessary, pierce the skin with a sharp instrument (a needle, a razor, or a sharp knife that has been sterilized by passing it through a flame several times).

3. Grasping the object at the end, remove it. Tweezers, small pincers, or forceps may be used for this purpose. (Whatever instrument you use should first be sterilized by boiling if at all possible.)

4. If the wound is superficial, apply gentle pressure to encourage bleeding.

5. Cover the wound with a dry, sterile dressing.

If the foreign object is under a fingernail or toenail, you may have to cut a V-shaped notch in the nail so that the object can be grasped by the forceps. Do not try to dig the object out from under the nail with a knife or similar instrument.

A curved or barbed object such as a fishhook may present special problems. Figure 4-49 shows one method of removing a fishhook that has become embedded in the flesh. As you can see from figure 4-50A, the barb on the hook prevents its direct removal. However, if you push the hook forward through the skin, as shown in figure 4-50B, you can clip off the barb with a wirecutter or similar tool, as shown in figure 4-50C. The remainder of the fishhook can then be withdrawn in the manner indicated in figure 4-50D.

WOUND CLOSING

The care of the wound is largely controlled by the tactical situation, facilities available, and the length of time before proper medical care may be available. Ordinarily, the advice to the corpsman regarding suturing of wounds would be DO NOT ATTEMPT IT. However, if days are to elapse before the patient can be seen by a surgeon, the corpsman should know how to use the various suture procedures and materials and how to select the most appropriate of both.

Before discussing the methods of coaptation (bringing together), some of the contraindications to wound closing should be described:

1. If there is reddening and edema of the wound margins, infection manifested by the

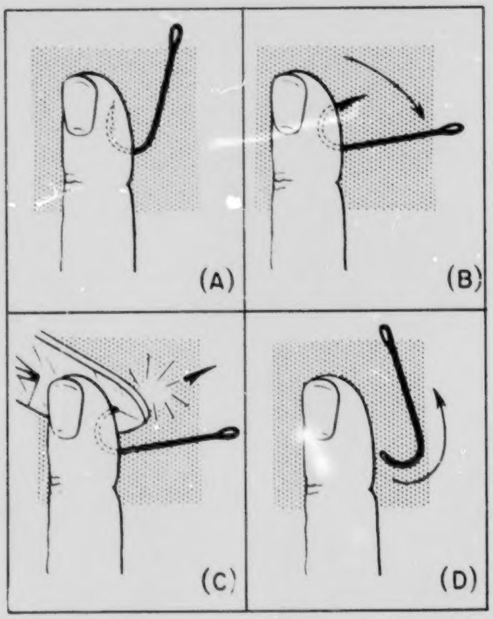

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Figure 4-50.—Removing a fishhook.

discharge of pus, and persistent fever or toxemia, DO NOT CLOSE THE WOUND. If these signs are minimal, the wound should be allowed to "clean up." The process may be hastened by warm, moist dressings, and irrigations with sterile saline solutions. These aid in liquefaction of wound necrotic materials and removal of thick exudates and dead tissues.

2. If the wound is a puncture wound, a large, gaping one of the soft tissue, or an animal bite, leave it unsutured. Even under the care of a surgeon, it is the rule not to close wounds of this nature until after the fourth day. This is called delayed primary closure and is performed under the indication of a healthy appearance of the wound. Healthy muscle tissue that is viable is evident by its color, consistency, blood supply, and contractibility. Muscle that is dead or dying is comparatively dark and mushy. It does not contract when pinched nor does it bleed when cut. If this type of tissue is evident, do not close the wound.

3. If the wound is deep, consider the support of the surrounding tissue, and if there is not enough support to bring the deep fascia together, do not suture because dead (hollow) spaces will be created. In this type of wound that is generally gaping, muscles, tendons, and nerves are usually involved. Only a surgeon should attempt this type of wound closure.

To a certain extent, firm pressure dressings and immobilization can obliterate hollow spaces. If tendons and nerves do not seem to be involved, absorbable sutures may be placed in the muscle (great care always being exercised to suture muscle fibers end-to-end and to correctly appose them) and the wound is closed in layers. This is extremely delicate surgery and the corpsman should exercise independent judgment on the advisability of attempting it, and then only if he or she has observed and assisted in numerous surgical operations.

If the wound is small, clean, and free from foreign bodies and signs of infection, steps should be taken to close it. All instruments should be checked, cleaned, and thoroughly sterilized. Use a good light and position the patient on the table so that access to the wound will be unhampered.

The area around the wound should be cleansed and then prepared with antiseptic. The wound area should be draped, whenever possible, to maintain a sterile field in which the corpsman works. The corpsman should wear cap and mask, scrub his or her hands and forearms, and wear sterile gloves.

Suturing

In modern surgery, many kinds of ligature and suture materials are used. All can be grouped into two classes:

1. Nonabsorbable sutures: those that cannot be absorbed by the body cells and fluids in which they are embedded during the healing process. When used as buried sutures, they become surrounded or encapsulated in fibrous tissue and remain as innocuous foreign bodies. When used as skin sutures, they are removed after the skin has healed. The most commonly used of this type of sutures and facts associated with them are:

a. Silk: frequent tissue reaction or "spitting" of suture from the wound.

b. Cotton: loses tensile strength with each autoclaving.

c. Linen: better than silk or cotton but more expensive and not as readily available.

d. Synthetic material: there are many, such as nylon and dermalon. These are excellent, particularly for surface use. They cause very little tissue reaction. Their only problem seems to be the tendency for the knots to come untied, so most surgeons tie 3 to 4 square knots in each suture. Nylon is preferred over silk for face and lip areas because silk causes tissue reactions too often.

e. Rust-proof metal: usually stainless steel wire or tantalum. This has the least tissue reaction of all suture materials and is by far the strongest. The primary problems are the need for wire cutters, and it is more difficult to use due to kinking.

2. Absorbable sutures: are absorbed or digested by the body cells and tissue fluids in which they are embedded during and after the healing processes. It is this characteristic that enhances their use beneath the skin surfaces and on mucous membranes.

Surgical gut fulfills the requirements for the perfect suture more often than any other material.

a. Manufacture of catgut: derived from the submucosal connective tissue of the first one-third (about 8 yards) of the small intestine of healthy government inspected sheep. The intestine of the sheep has certain characteristics that make it especially adaptable for surgical use. It is of uniformly fine-grained tissue structure and possesses great tensile strength and elasticity.

b. Tensile strength of catgut: this suture material is available in sizes of 6-0 to 0 and 1 to 4, with 6-0 being the smallest diameter and 4 being the largest. The tensile strength increases with the diameter of the suture.

c. Kinds of surgical gut (catgut): this varies from plain catgut that is the row gut that has been gauzed, polished, sterilized, and packaged, to chromic catgut that has undergone various intensities of tanning with one of the salts of chromic acid to delay the tissue absorption time. Some examples of these variations and absorption times are as follows:

(1) Type A: Plain, 10 days
(2) Type B: Mild chromic, 20 days
(3) Type C: Medium chromic, 30 days
(4) Type D: Extra chromic, 40 days

Suture needles may be straight or curved and have either a tapered round point or a cutting edge point. They vary in length, curvature, and diameter for various types of suturing.

1. Sizing: suture needles are sized by diameter and come in many sizes depending on use.

2. Taper point: these cause small amounts of tissue damage and are most often used in deep tissues.

3. Cutting edge point: this is the preferred needle for suturing the skin because of the toughness of the skin.

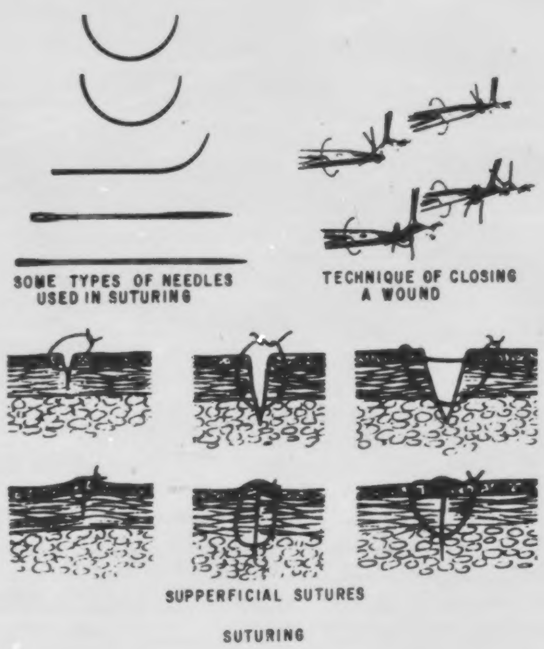
4. Atraumatic (atraloc, wedged): these needles may either have a cutting edge or taper point and have the suture fixed on the end of the needle by the manufacturer to cause the least tissue trauma.

Preparation of Casualty

1. Examine the casualty carefully to determine what materials are needed to properly perform suturing.

a. Select and prepare sterile instruments, needles, and suture materials.
b. Ensure that the patient is securely fastened into the selected position and that access to the wound or the suture tray is not hampered.
c. Make sure a good light is available.

2. Aseptic wound preparation is to be strictly observed. Use mask, cap, and gloves. Thorough cleaning and proper draping is essential.


SOME TYPES OF NEEDLES USED IN SUTURING
TECHNIQUE OF CLOSING A WOUND
SUPPERFICIAL SUTURES
SUTURING

154.153

Figure 4-51.—Suturing.

3. Select an anesthetic with care. Consider the patient's tolerance to pain, time of the injury, medications given, and the possible distortion of the tissue by injecting local anesthesia. Do not use an anesthetic containing epinephrine on the digits.

General Principles of Wound Suturing

1. In general, wounds less than 6 hours old can be closed without the danger of infection. Wounds 6 to 14 hours old may be closed if they are not grossly contaminated and are meticulously cleaned. Wounds 14 to 24 hours old should not be closed primarily. When reddening and edema of the wound margins, discharge of pus, persistent fever, or toxemia are present, do not close the wound. Do not close primarily a large, gaping, soft tissue wound. This type of wound is certain to contain large quantities of bacteria. These wounds will require warm wet dressings and irrigations, along with aseptic care for 3 to 7 days to clear up the wound. Then a delayed wound closure may be performed.

2. Debride the wound area and convert circular wounds to elliptical ones before suturing. Circular wounds cannot be closed with satisfactory cosmetic result.

3. Try to convert a jagged laceration to one with smooth edges before suturing it. Make sure that not too much skin is trimmed off that would make the wound difficult to approximate. See figure 4-51.

4. Use the correct technique for placing sutures. The needle holder is applied at approximately one quarter of the distance from the blunt end of the needle. Suturing with a curved needle is done toward the person doing the suturing. Insert the needle into the skin at a 90° angle and sweep it through an arclike motion, following the general arc of the needle.

5. Carefully avoid bruising the skin edges being sutured. Use Adson forceps and very lightly grasp the skin edges. It is improper to use dressing forceps while suturing. Since there are no teeth on the grasping edges of the dressing forceps, the force required to hold the skin firmly may be enough to cause necrosis.

6. Do not put sutures in too tight. Gentle approximation of the skin is all that is necessary. Remember that postoperative edema will occur in and about the wound, making sutures tighter.

7. If there is a significant chance that the sutured wound may become infected (bites, delayed closure, grossly contaminated), place a small iodoform or rubber drain in the wound and remove it in 48 hours.

8. When suturing, the best cosmetic effect is obtained by using numerous interrupted simple sutures placed one-eight inch apart. Where cosmetic result is not a consideration, sutures may be slightly further apart. Generally, the distance of the bite from the wound edges should be equal to the distance between sutures.

9. When subcutaneous sutures are needed, it is proper to use 4-0 chromic catgut.

10. When deciding the type of material to use on skin, use the finest diameter that will satisfactorily hold the tissues.

a. Children under 3 yrs, face:	6-0
b. All other faces	5-0
c. Body	4-0
d. Feet, elbows, knees #34 or #36 wire or	4-0
e. Children's scalp	4-0
f. Adult scalp	3-0
g. Lip	6-0 or 5-0

11. When cutting sutures, subcutaneous catgut should have a 1/16-inch tail. Silk skin sutures should be cut as short as is practical for removal on the face and lip. Elsewhere, skin sutures may have longer tails for convenience, but a tail over one-fourth inch is unnecessary and tends to collect exudate.

12. The following general rules can be used in deciding when to remove sutures:

a. Face: as a general rule, 4 or 5 days. Better cosmetic results are obtained by removing every other suture and any suture with redness around it on the 3rd day and the remainder on the 5th day.

b. Body and scalp: 7 days.

c. Soles, palms, back or over joints: 10 days unless excess tissue reaction is apparent around the suture, in which case they should come out sooner.

d. Any suture with pus or infection around it should be removed immediately, since its presence will make the infection worse.

e. When wire is used, it may be left in safely for 10 to 14 days.

SHOCK

Shock is the collapse of the cardiovascular system, characterized by circulatory deficiency and depression of vital function. There are several types of shock. Hypovolemic shock is due to diminished blood volume; neurogenic shock results from the loss of vascular control by the nervous system; cardiogenic shock is due to inadequate functioning of the heart; septic shock develops in the presence of severe infection; and anaphylactic shock is due to an allergic reaction. Multiple types of shock may be present in varying degrees in the same patient. The most frequently encountered and most important type for the corpsman to understand is hemorrhagic shock, a type of hypovolemic shock.

In shock the diminished blood volume causes a markedly lessened cardiac output and reduced peripheral circulation. This results in a lowered transport of oxygen to the tissues (hypoxia); decreased perfusion, the circulation of blood within an organ; and a lowered transport of waste products away from the tissue cells. Under these conditions, body cells are able to carry on their normal functions for only a short period of time. Soon they begin to malfunction and then shut down. Certain cells, especially in the heart, brain, liver, and kidneys, are highly susceptible to temporary or permanent damage. Permanent renal shutdown is an ever present danger in shock.

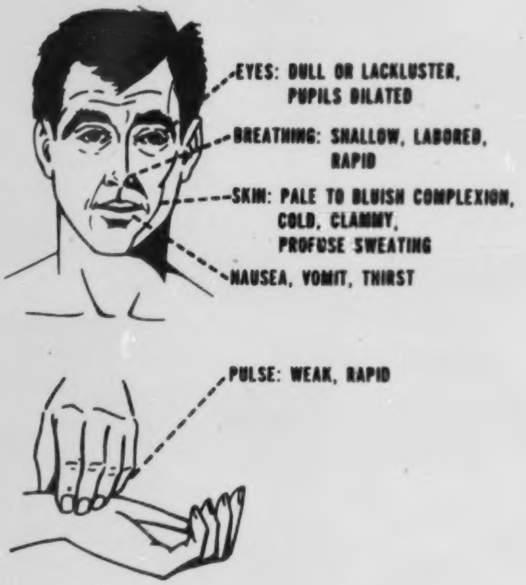
Shock should be expected in all cases of gross hemorrhage, abdominal or chest wounds, crush or blast injuries, extensive large muscle damage, particularly of the extremities, major fractures, traumatic amputations, head injuries, burns involving more than 10% of the body surface area, or any other major injury.

The symptoms of shock vary from patient to patient and even during the course of illness in an individual. Evaluation of the whole situation is more important than one particular sign or symptom.

The essence of shock control and prevention is to recognize the onset of the condition and to start treatment before the symptoms fully develop.

The following are general signs and symptoms of the development of shock: (See figure 4-52)

1. Restlessness and apprehension are early symptoms, often followed by apathy.
2. Eyes may be glassy, lack luster, have dilated pupils (unless morphine has been given).


EYES: DULL OR LACKLUSTER, PUPILS DILATED
BREATHING: SHALLOW, LABORED, RAPID
SKIN: PALE TO BLUISH COMPLEXION, COLD, CLAMMY, PROFUSE SWEATING
NAUSEA, VOMIT, THIRST
PULSE: WEAK, RAPID

154.154

Figure 4-52.—Symptoms of shock.

3. Breathing may be rapid or labored, often of the gasping "air hunger" type. In the advanced stages of shock, breathing becomes shallow and irregular.

4. The face and skin may be very pale or ashen gray; in the dark complexioned the mucous membranes may be pale. The lips are often cyanotic.

5. The skin feels cool and is covered with clammy sweat. The coolness is related to a decrease in the peripheral circulation.

6. The pulse tends to become rapid, weak, and thready. If blood pressure is severely lowered, the pulse will be absent. The pulse rate in hemorrhagic shock may reach 140 or higher. An exception is neurogenic shock, where the pulse rate is slowed, often below 60.

7. The blood pressure is usually lowered in moderately severe shock as the systolic pressure drops below 100 while the pulse rises above 100. The body is compensating for circulatory fluid loss by peripheral vasoconstriction. This process tends to maintain the blood pressure at nearly a normal level despite moderately severe loss of circulating blood volume. A point comes, however, when decompensation occurs, and a small additional loss will then produce an alarming and sudden fall in blood pressure.

8. There may be nausea, vomiting, and dryness of the mouth, lips, and tongue.

9. Surface veins collapse. Veins normally visible at the front of the elbow, forearms, and the back of the hands will be hard to distinguish.

10. There are frequent complaints of thirst. Even severely wounded may complain of thirst rather than pain.

11. The kidneys may shut down, and urine formation either ceases or becomes greatly diminished if the systolic blood pressure falls below 80 for long periods of time.

12. The person may faint from inadequate venous blood return to the heart. This may be the result of a serious circulatory disturbance, but often it is the result of a temporary gravitational pooling of the blood associated with standing up too quickly.

Specific Types of Shock

Hypovolemic Shock

This condition is also known as oligemic or hematogenic shock. The essential feature of all forms of hypovolemic shock is loss of fluid from the circulating blood volume, so that adequate circulation cannot be maintained to all parts of the body.

In cases where there is internal or external hemorrhage due to trauma (hemorrhagic shock) there is loss of whole blood including red cells. The body tends to restore the circulatory volume by supplying fluid from the body tissues. There is a resulting progressive fall in the hematocrit (ratio of red blood cells to plasms) and in the red blood cell count due to hemodilution.

In burn shock, on the other hand, there is a progressively increased hematocrit and red blood cell count due to hemoconcentration from loss of the plasma fraction of the blood into and through the burned area.

A third form of hypovolemic shock occurs in cases of severe diarrhea and vomiting, where body fluids and electrolytes (sodium, potassium, and chloride) are lost. This also contributes to a decrease in circulating blood volume.

Neurogenic Shock

Neurogenic shock, sometimes called vasogenic shock, results from the disruption of autonomic nervous system control over vasoconstriction. Under normal conditions the autonomic nervous system keeps the muscles of the veins and arteries partially contracted. At the onset of most forms of shock, further constriction is signaled. The vascular muscles cannot maintain this contraction indefinitely, however. A number of factors, including increased fluid loss, central nervous system trauma, or emotional shock, can override the autonomic nervous system control. The veins and arteries immediately dilate, drastically expanding the volume of the circulatory system, with a corresponding reduction of the volume and pressure of the fluid in circulation.

Simple fainting (syncope) is a variation of neurogenic shock. It often is the result of a temporary gravitational pooling of the blood as a person stands up. As the person falls, blood again rushes to the head, and the problem is solved. It may also be induced by fear or horror, which override the autonomic nervous system control.

Other variations of neurogenic shock that are psychological in origin and important to the corpsman are shell shock and bomb shock. These are adjustment reactions to extremely stressful wartime experiences. Symptoms range from intense fear to complete dementia and are manifestations of a loss of nervous control.

Cardiogenic Shock

Cardiogenic shock is caused by inadequate functioning of the heart, not by loss of circulating blood volume. If the heart muscle is weakened by disease or damaged by trauma or lack of oxygen, as in cases of pulmonary disease, suffocation, or myocardial infarction, the heart will no longer be able to maintain adequate circulatory pressure, even though the volume of fluid is unchanged. Shock will develop as the pressure falls. Heart attack is an extreme medical emergency all corpsmen must be ready to handle. It will be discussed in greater detail in the Common Medical Emergencies section of this chapter.

Septic Shock

Septic shock usually does not develop for 2 to 5 days after an injury, consequently the HM will not often see it in a first-aid situation. It may appear during the course of peritonitis as a result of penetrating abdominal wounds or perforation of the appendix. It may also result from gross wound contamination, rupture of an ulcer, or as a complication of certain types of pneumonia. Septic shock is the result of vasodilation of small blood vessels in the wound area, or general vasodilation if the infection has entered the bloodstream. In addition to increasing circulatory system volume, the walls of the blood vessels become more permeable, allowing fluids to escape into the tissues. This type of shock carries a poor prognosis and must almost always be treated under the direct supervision of a medical officer.

Anaphylactic Shock

This type of shock occurs when an individual is exposed to a substance to which his or her body is particularly sensitive. In its most severe form, the body goes into an almost instantaneous violent reaction. A burning sensation, itching, and hives spread across the skin. Severe edema effects body parts and the respiratory system. Blood pressure drops alarmingly, and fainting or coma may develop.

The causative agent may be introduced into the body in a number of ways. The injection of medicines, especially penicillin and egg-cultured serums, is one route. Another is the injection of venoms by stinging insects and animals. The inhalation of dusts, pollens, or other materials to which a person is sensitive is a third route. Finally, a slightly slower but no less severe reaction may develop from the ingestion of certain foods and medications. Specific treatment of venoms and poisons will be discussed in the Poison/Drug Abuse section of this chapter.

General Treatment Procedures

Intravenous fluid administration is the single most important factor in the treatment of any type of shock except cardiogenic shock. The proper use of IV equipment and fluids are discussed in the Patient Care chapter of this manual. Ringer's lactate is probably the best solution to use, although normal saline is adequate until properly cross-matched whole blood can be administered. The electrolyte solutions replace not only lost blood volume, but also lost extracellular fluid that has been depleted to bolster the shrunken blood volume. If the shock situation is severe enough to warrant immediate administration of IV fluids, transportation to a medical facility will be delayed, and a medical officer is not available in the first-aid situation to write an administrative order, be conservative. Start the IV fluid and let it run at a slow rate of 50 to 60 drops per minute. If IV solutions are unavailable, transportation to a medical facility will be delayed, and there are no contraindications such as gastrointestional bleeding or unconsciousness, the patient may receive an electrolyte solution by mouth. This may be prepared by adding a teaspoon of salt and half a teaspoon of baking soda to a quart or liter of water. Allow the patient to sip the solution.

Other shock treatment procedures that should be followed are:

1. Maintain an open airway. Oxygen may also be administered if proper equipment is available.

2. Control hemorrhage.

3. Check for other injuries that may have been sustained. Remove the victim from the presence of identifiable causative agents.

4. Place the victim in a supine position, with the feet slightly higher than the head (shock position). Certain problems, such as breathing difficulties or head injuries, may require other positioning.
5. Reduce pain by splinting fractures, providing emotional support, and attending to the victim's comfort. Unless contraindicated, aspirin may be dispensed.
6. Conserve body heat.
7. Avoid rough handling and transport the victim quickly to a medical treatment facility.
8. If transportation to a definitive care facility will be lengthy or delayed, seek the radio or phone advice of a medical officer on whether or not to give fluids by mouth or start an IV. If this is impossible, use your own judgment. Cardiogenic shock is the one exception to this rule. DO NOT start IV fluid since volume is sufficient and only function is impared.
9. Constantly monitor and record vital signs every 15 minutes so that you are able to keep track of the victim's progress.

Pain Relief

As a corpsman in the field or on board ship in wartime, you may be issued morphine Syrettes for the control of shock through relief of severe pain. You will be issued this controlled drug under very strict accountability procedures. Possession of this drug is a medical responsibility that must not be taken lightly.

Morphine Administration

Morphine is the most effective of all pain-relieving drugs. Properly administered in selected patients, it will relieve distressing pain and assist in the prevention of shock. The adult dose of morphine is 8 to 16 mg repeated, if necessary, in not less than 4 hours. Morphine has several undesirable effects, however, and these must be thoroughly understood by the corpsman.

1. Morphine is a severe respiratory depressant and therefore must not be given to patients in moderate or severe shock or to patients with respiratory failure with respiratory obstruction.

2. Morphine increases intracranial pressure and may induce vomiting; these effects may be disastrous in head injury cases.

3. Morphine causes constriction of the pupils (pinpoint pupils) and this action prevents the use of the pupillary reactions and eye-ground changes for diagnosis in head injuries.

4. Morphine poisoning is an ever-present danger. There is a narrow safety margin between the amounts of morphine that may be given therapeutically and the amounts that produce death. This is especially true of the patient in shock.

5. Morphine causes considerable mental confusion and interference with the proper exercise of judgment and therefore should not be given to ambulatory patients.

6. Morphine is a dangerously habituating drug. It should not be given trivially and must be rigidly accounted for. Under no circumstances should the corpsman administer morphine except in an emergency.

Morphine is supplied aboard ships and in the field in a Syrette. The Syrette is composed of a collapsible metal tube fitted with a hypodermic needle, a stylet in the needle, and a plastic tube to protect the needle. The Syrette contains 16 mg of morphine tartrate. To use the Syrette, remove the plastic tube, grasp the stylet and push it into the tube until the circle at the top of the stylet is stopped by the guard; then remove the stylet and use the Syrette, with sterile technique.

Morphine administration to patients in shock or with extensive burns should be rigidly controlled. Morphine administered by subcutaneous or intramuscular routes may not be absorbed into the bloodstream because of the reduced peripheral circulation, and pain may persist. When this happens the uninformed often give additional doses, hoping to bring about relief. Then when resuscitation occurs, and the peripheral circulation improves, the stored quantities of morphine are released into the system, and an extremely serious condition (morphine poisoning) ensues. When other pain-relieving drugs are not available, and the patient in shock or with burns is in severe pain, 16 mg of morphine may be given intramuscularly (followed by massage of the injected site), but the temptation to give more must be resisted. Doses should not be repeated more than twice and then at least 4 hours apart, unless ordered otherwise by a medical officer.

If the pain from the wound is agonizingly severe, a morphine Syrette may be given if examination of the patient reveals no:

1. Head injury.

2. Chest injury, including nonsucking and sucking wounds.

3. Wound of the throat, nasal passages, oral cavity, or jaws wherein blood might obstruct the airway.

4. Massive hemorrhage.

5. Respiratory impairment, including chemical burns of the respiratory tract. Any casualty having fewer than 16 respirations per minute should not be given morphine.

6. Evidence of severe or deepening shock.

7. Loss of consciousness.

Overdose is an ever-present danger. For this reason every casualty who has received morphine should be plainly identified. Write the letter "M" and the hour of injection on the patient's forehead, e.g., M 0830. A skin pencil, colored antiseptic, or ink may be used for this purpose. The empty morphine syrette should be attached to the shirt collar or other conspicuous area of clothing by a safety pin or other means to alert others that the drug has been administered.

INJURIES TO BONES, JOINTS, AND MUSCLES

Many kinds of accidents cause injuries to bones, joints, or muscles. In giving first aid to an injured person, you must always look for signs of fractures (broken bones), dislocations, sprains, strains, and contusions.

An essential part of the first aid treatment for fractures consists of immobilizng the injured part with splints so that the sharp ends of broken bones will not move around and cause further damage to nerves, blood vessels, or vital organs. Splints are also used to immobilize severely injured joints or muscles and to prevent the enlargement of extensive wounds. You must have a general understanding of the use of splints before going on to learn the detailed first aid treatment for injuries to bones, joints, and muscles.

USE OF SPLINTS

In an emergency almost any firm object or material will serve as a splint. Thus umbrellas, canes, rifles, tent pegs, sticks, oars, wire mesh, boards, corrugated cardboard, and folded newspapers can be used as splints. A fractured leg may sometimes be splinted by fastening it securily to the uninjured leg.

Splints, whether ready-made or improvised, must fulfill certain requirements. They should be lightweight, strong, fairly rigid, and long enough to reach past the joints above and below the fracture. Splints should be wide enough so that the bandages used to hold them in place will not pinch the injured part. Splints must be well padded on the sides touching the body; if they are not properly padded, they will not fit well and will not adequately immobilize the injured part. If you have to improvise the padding for a splint, you may use clothing, bandages, cotton, blankets, or any other soft material. If the victim is wearing heavy clothes, you may be able to apply the splint on the outside, thus allowing the clothing to serve as the least part of the required padding. Fasten splints in place with bandages, strips of adhesive tape, clothing, or other suitable materials. If possible, one person should hold the splints in position while another person fastens them.

Although splints should be applied snugly, they should NEVER be tight enough to interfere with the circulation of the blood. When you are applying splints to an arm or a leg, try to leave the fingers or toes exposed. If the tips of the fingers or toes become blue or cold, you will know that the splints or bandages are too tight. You should examine a splinted part approximately every half hour and loosen the fastenings if the circulation appears to be impaired. Remember that any injured part is likely to swell, and splints or bandages that are applied correctly may later become too tight.

INJURIES TO BONES

A break in a bone is called a FRACTURE. There are two main kinds of fractures. A CLOSED FRACTURE is one in which the injury is entirely internal; the bone is broken but there is no break in the skin. An OPEN FRACTURE is one in which there is an open wound in the tissues and the skin. Sometimes the open wound is made when a sharp end of the broken bone pushes out through the flesh; sometimes it is made by an object such as a bullet that penetrates from the outside. Figure 4-53 shows closed (A) and open (B) fractures.

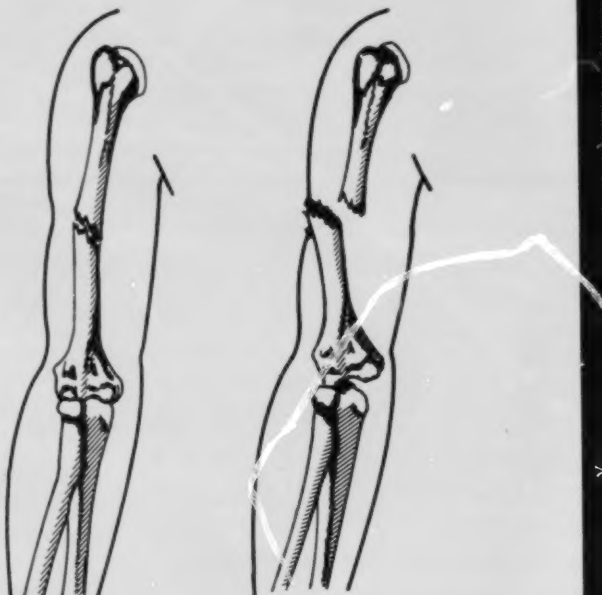


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Figure 4-53.—Closed and open fractures.

Open fractures are more serious than closed fractures. They usually involve extensive damage to the tissues and are quite likely to become infected. Closed fractures are sometimes turned into open fractures by rough or careless handling of the victim.

It is not always easy to recognize a fracture. All fractures, whether closed or open, are likely to cause severe pain and shock; but the other symptoms may vary considerably. A broken bone sometimes causes the injured part to be deformed or to assume an unnatural position. Pain, discoloration, and swelling may be localized at the fracture site, and there may be a kind of wobbly movement if the bone is broken clear through. It may be difficult or impossible for the victim to move the injured part; if able to move it, there may be a grating sensation (crepitus) as the ends of the broken bone rub against each other. However, if a bone is cracked rather than broken through, the victim may be able to move the injured part without much difficulty. An open fracture is easy to recognize if an end of the broken bone protrudes through the flesh. If the bone does not protrude, however, you might see the external wound but fail to recognize the broken bone.

If you are required to give first aid to a person who has suffered a fracture, you should follow these general rules:

1. If there is any possibility that a fracture has been sustained, treat the injury as a fracture until an X-ray can be made.

2. Get the victim to a definitive care facility at the first possible opportunity. All fractures require medical treatment.

3. Do not move the victim until the injured part has been immobilized by splinting, unless the move is necessary to save life or to prevent further injury.

4. Treat for shock.

5. Do not attempt to locate a fracture by grating the ends of the bone together.

6. Do not attempt to set a broken bone, unless a medical officer will not be available for many days.

7. When a long bone in the arm or leg is fractured, the limb should be carefully straightened so that splints can be applied, unless it appears that further damage will be caused by such a maneuver. Never attempt to straighten the limb by applying force or traction with an improvised windlass or any other device. Pulling gently with your hands in the long axis of the limb is permissible and may be all that is necessary to get the limb back into position.

8. Apply splints. If the victim is to be transported only a short distance, or if treatment by a medical officer will not be delayed, it is probably best to leave the clothing on and place emergency splinting over it. However, if the victim must be transported for some distance, or if a considerable period of time will elapse before treatment by a medical officer, it may be better to remove enough clothing so that you can apply well padded splints directly to the injured part. If you decide to remove clothing over the injured part, cut the clothing or rip it along the seams. In any case, BE CAREFUL! Rough handling of the victim may convert a closed fracture into an open fracture, increase the severity of shock, and cause extensive damage to the blood vessels, nerves, muscles, and other tissues around the broken bone.

9. If the fracture is open, you must take care of the wound before you can deal with the fracture. Bleeding from the wound may be profuse; however, most bleeding can be stopped by direct pressure on the wound. Other supplemental methods of hemorrhage control are discussed in the wound section of this chapter. Use a tourniquet as a last resort. After you have stopped the bleeding, treat the fracture.

Now that we have seen the general rules for treating fractures, we turn to the symptoms and emergency treatment of specific fracture sites.

Fracture of the Forearm

There are two long bones in the forearm, the radius and the ulna. When both are broken the arm usually appears to be deformed. When only one bone is broken, however, the other acts as a splint and the arm therefore retains a more or less natural appearance. Any fracture of the forearm is likely to result in pain, tenderness, inability to use the forearm, and a kind of wobbly motion at the point of injury. If the fracture is open, a bone may show through.

Treatment. If the fracture is open, stop the bleeding and threat the wound. Apply a sterile dressing over the wound.

Carefully straighten the forearm. (Remember that rough handling of a closed fracture may turn it into an open fracture.)

Apply two well-padded splints to the forearm, one on the top and one on the bottom. Be sure that the splints are long enough to extend from the elbow to the wrist. Use bandages to hold the splints in place.

Put the forearm across the chest. The palm of the hand should be turned in, with the thumb pointing upward. Support the forearm in this position by means of a wide sling and a cravat bandage, as shown in figure 4-54. The hand should be raised about four inches above the level of the elbow.

As in all cases of fracture, treat the victim for shock and evacuate as soon as possible.

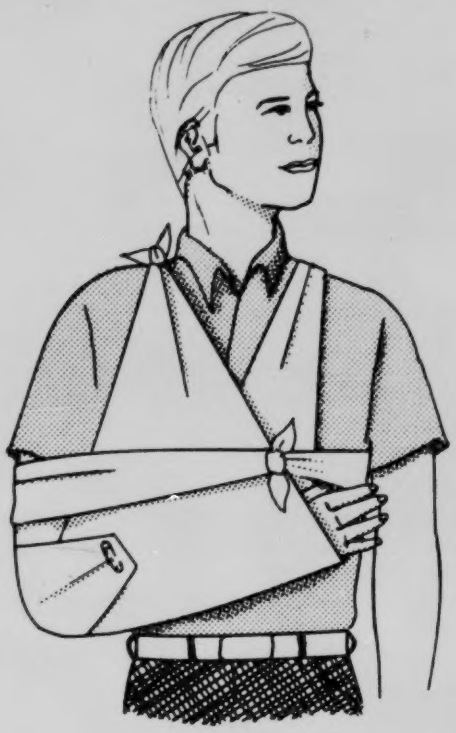

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Figure 4-54.—First aid for a fractured forearm.

Fracture of the Upper Arm

The signs of fracture of the upper arm include pain, tenderness, swelling, and wobbly motion at the point of fracture. If the fracture is near the elbow, the arm is likely to be straight with no bend at the elbow.

Treatment. If the fracture is open, stop the bleeding and treat the wound before attempting to treat the fracture. NOTICE THAT TREATMENT OF THE FRACTURE DEPENDS PARTLY UPON THE LOCATION OF THE BREAK.

If the fracture is in the upper part of the arm near the shoulder, place a pad or folded towel in the armpit, bandage the arm securely to the body, and support the forearm in a narrow sling.

If the fracture is in the middle of the upper arm, you can use one well padded splint on the outside of the arm. The splint should extend from the shoulder to the elbow. Fasten the splinted arm firmly to the body and support the forearm in a narrow sling, as shown in figure 4-55.

Another way of treating a fracture in the middle of the upper arm is to fasten two wide splints or four narrow ones about the arm and support the forearm in a narrow sling. If you use a splint between the arm and the body, be very careful that it does not extend too far up into the armpit; a splint in this position can cause a dangerous compression of the blood vessels and nerves and may be extremely painful to the victim.

If the fracture is at or near the elbow, the arm may be either bent or straight. No matter what position you find the arm in, DO NOT

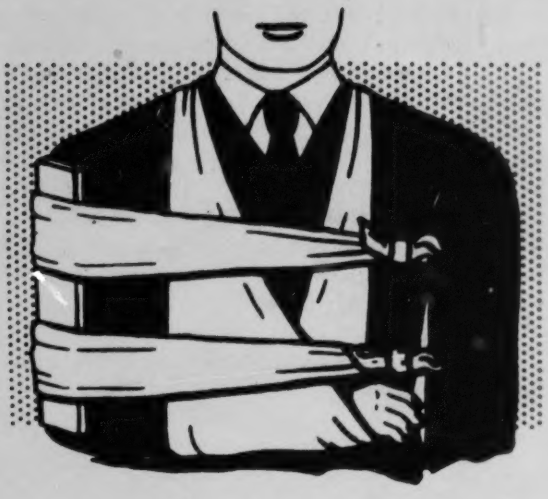

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Figure 4-55.—Splint and sling for a fractured upper arm.

ATTEMPT TO STRAIGHTEN IT OR TO MOVE IT IN ANY WAY. Splint the arm as carefully as possible in the position in which you find it. This will prevent further nerve and blood vessel damage.

Treat the victim for shock and get him or her under the care of a medical officer as soon as possible.

Fracture of the Thigh

The femur is the long bone of the upper part of the leg between the kneecap and the pelvis. When the femur is fractured, any attempt to move the limb results in a spasm of the muscles and causes excruciating pain. The leg has a wobbly motion, and there is complete loss of control below the fracture. The limb usually assumes an unnatural position, with the toes pointing outward. The fractured leg is shorter than the uninjured one, by actual measurement, due to the pull of the powerful thigh muscles. Serious damage to blood vessels and nerves often results from a fracture of the femur. Shock is likely to be severe.

Treatment. If the fracture is open, stop the bleeding and treat the wound before attempting to treat the fracture itself. Serious bleeding is a special danger in this type of injury, since the broken bone may tear or cut the large artery in the thigh.

Carefully straighten the leg. Apply two splints, one on the outside of the injured leg and one on the inside. The outside splint should reach from the armpit to the foot. The inside splint should reach from the crotch to the foot. The splints should be fastened in five places: (1) around the ankle; (2) over the knee; (3) just below the hip; (4) around the pelvis; and (5) just below the armpit (fig. 4-56). The legs can then be tied together to support the injured leg as firmly as possible.

It is essential that the fractured thigh be splinted before the victim is moved. Ready-made splints are best, but improvised splints may be

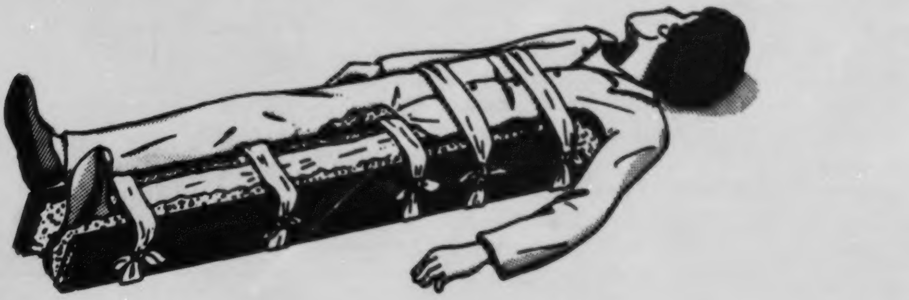

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Figure 4-56.—Splint for a fractured femur.

used. Figure 4-56 shows how boards may be used as an emergency splint for a fractured thigh. Remember, DO NOT MOVE THE VICTIM UNTIL THE INJURED LEG HAS BEEN IMMOBILIZED.

Treat the victim for shock, and evacuate at the earliest possible opportunity.

Fracture of the Lower Leg

When both bones of the lower leg are broken, the usual signs of fracture are likely to be present. When only one bone is broken, the other one acts as a splint and thus to some extent prevents deformity of the leg. However, tenderness, swelling, and pain at the point of fracture are almost always present. A fracture just above the ankle is often mistaken for a sprain. If both bones of the lower leg are broken, an open fracture is very likely to result.

Treatment. If the fracture is open, stop the bleeding and treat the wound. Carefully straighten the injured leg. Apply THREE splints—one on each side of the leg and one underneath. Be sure that the splints are well padded, particularly under the knee and at the bones on each side of the ankle.

A pillow and two side splints work very well for treatment of a fractured lower leg. Place the pillow beside the injured leg, then carefully lift the leg and place it in the middle of the pillow. Bring the edges of the pillow around to the front of the leg and pin them together. Then place one splint on each side of the leg, over the pillow, and fasten them in place with strips of bandage or adhesive tape.

Treat the victim for shock and evacuate as soon as possible. When available the Hare or Thomas half-ring traction splints may be used.

Fracture of the Kneecap

The following first-aid treatment should be given for a fractured kneecap (patella):

Carefully straighten the injured limb. Immobilize the fracture by placing a padded board under the injured limb. The board should be at least four inches wide and should reach from the buttock to the heel. Place extra padding under the knee and just above the heel, as shown in figure 4-57. Use strips of bandage to fasten the leg to the board in four places: (1) just below the knee; (2) just above the knee; (3) at the ankle; and (4) at the thigh. DO NOT COVER THE KNEE ITSELF. Swelling is likely to occur very rapidly, and any bandage or tie fastened over the knee would quickly become too tight.

Treat the victim for shock and evacuate as soon as possible.

Fracture of the Clavicle

A person with a fractured clavicle usually shows definite symptoms. When the victim stands, the injured shoulder is lower than the uninjured one. The victim is usually unable to raise the arm above the level of the shoulder. The victim may attempt to support the injured shoulder by holding the elbow of that side in the other hand. This is the characteristic position of a person with a broken clavicle. Since the clavicle lies immediately under the skin, you may be able to detect the point of fracture by the deformity and localized pain and tenderness.

Treatment. If the fracture is open, stop the flow of blood and treat the wound before attempting to treat the fracture. Then apply a sling and swathe splint as described below:

Bend the victim's arm on the injured side, and place the forearm across the chest. The

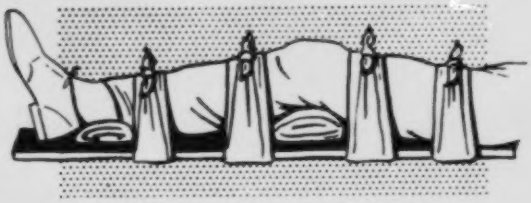

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Figure 4-57.—Immobilization of a fractured patella.

palm of the hand should be turned in, with the thumb pointed up. The hand should be raised about four inches above the level of the elbow. Support the forearm in this position by means of a wide sling (fig. 4-58). A wide roller bandage (or any wide strip of cloth) may be used to fasten the victim's arm to the body (see fig. 4-54). A figure-of-eight bandage may also be used for a fractured clavicle.

Treat the victim for shock and evacuate to a definitive care facility as soon as possible.

Fracture of the Rib

If ribs are broken, the victim should be made comfortable and quiet so that the greatest danger—the possibility of further damage to the lungs, heart, or chest wall by the broken ends—is minimized.

The common finding in all victims with fractured ribs is pain localized at the site of the fracture. By asking the patient to point out the exact area of the pain, you can often determine the location of the injury. There may or may not be a rib deformity, chest wall contusion, or laceration of the area. Deep breathing, coughing, or movement is usually painful. The patient generally wishes to remain still and may often lean toward the injured side, with the hand over the fractured area to immobilize the chest and to ease the pain.

Ordinarily rib fractures are not bound, strapped, or taped if the victim is reasonably comfortable. However, they may be splinted by the use of external support. If the patient is considerably more comfortable with the chest immobilized, the best method is to use a swathe (fig. 4-59) in which the arm on the injured side is strapped to the chest to limit motion. Place the arm on the injured side against the chest, palm flat, thumb up, with the forearm raised to a 45° angle. Immobilize the chest, using wide strips of bandage to secure the arm to the chest.

Wide strips of adhesive plaster applied directly to the skin of the chest for immobilization should not be used since the adhesive tends

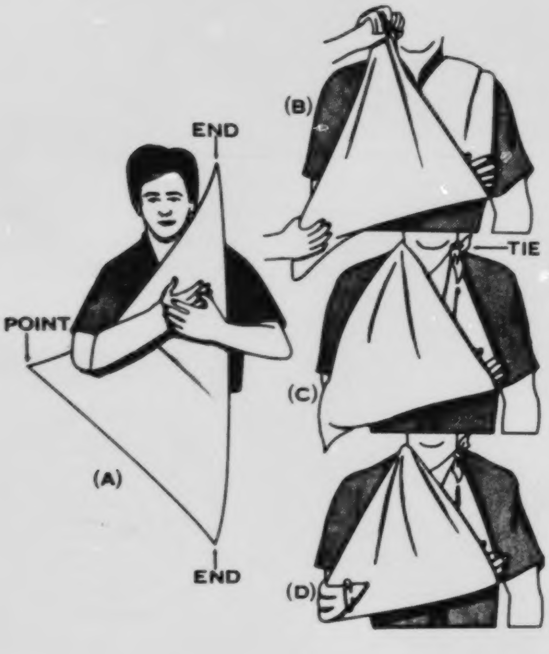

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Figure 4-58.—Sling for immobilizing fractured clavicle.

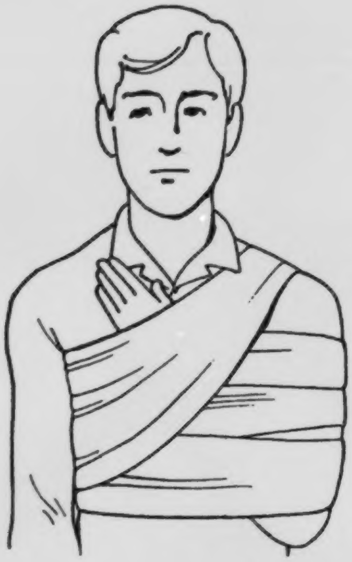

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Figure 4-59.—Swathe bandaging of fractured rib victim.

to limit the ability of the chest to expand and thus interferes with proper breathing.

Treat the victim for shock and evacuate as soon as possible.

Fracture of the Nose

A fracture of the nose usually causes localized pain and swelling, a noticeable deformity of the nose, and extensive nosebleed.

Treatment. Stop the nosebleed. Have the victim sit quietly, with the head tipped slightly backward. Tell the victim to breathe through the mouth and not to blow the nose. If the bleeding does not stop within a few minutes, apply a cold compress or an ice bag over the nose.

Treat the victim for shock and see that he or she receives a medical officer's attention as soon as possible. Permanent deformity of the nose may result if the fracture is not treated promptly.

Fracture of the Jaw

A person who has a fractured jaw may suffer serious interference with breathing. There is likely to be great difficulty in talking, chewing, or swallowing. Any movement of the jaw causes pain. The teeth may be out of line, and there may be bleeding from the gums. Considerable swelling may develop.

Treatment. One of the most important phases of emergency care is to clear the upper respiratory passage of any obstruction. If the fractured jaw interferes with breathing, pull the lower jaw and the tongue well FORWARD and keep them in that position.

Apply a four-tailed bandage, as shown in figure 4-60. Be sure that the bandage pulls the lower jaw FORWARD. Never apply a bandage that forces the jaw backward, since this might seriously interefere with breathing. The bandage must be firm so that it will support and immobilize the injured jaw, but it must not press against the victim's throat. Be sure that the victim has scissors or a knife to cut the bandage in case of vomiting. Treat the victim for shock and evacuate as soon as possible.

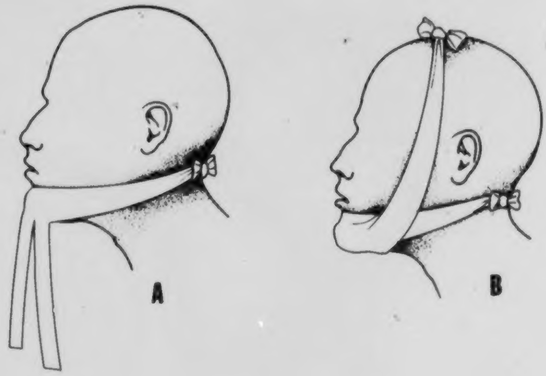

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Figure 4-60.—Four-tailed bandage for the jaw.

Fracture of the Skull

When a person suffers a head injury, the greatest danger is that the brain may be severely damaged; whether or not the skull is fractured is a matter of secondary importance. In some cases injuries that fracture the skull do not cause serious brain damage; but brain damage can, and frequently does, result from apparently slight injuries that do not cause damage to the skull itself.

It is often difficult to determine whether an injury has affected the brain, because the symptoms of brain damage vary greatly. A person who has suffered a head injury must be handled very carefully and given immediate medical attention.

Some of the symptoms that may indicate brain damage are listed below. However, you must remember that all of these symptoms are not always present in any one case, and that the symptoms that do occur may be greatly delayed.

1. Bruises or wounds of the scalp may indicate that the victim has sustained a blow to the head. Sometimes the skull is depressed (caved in) at the point of impact. If the fracture is open, you may find glass, shrapnel, or other objects penetrating the skull.
2. The victim may be conscious or unconscious. If conscious, the victim may feel dizzy and weak, as though about to faint.

3. Severe headache sometimes (but not always) accompanies head injuries.

4. The pupils of the eyes may be unequal in size and may not react normally to light.

5. There may be bleeding from the ears, nose, or mouth.

6. The victim may vomit.

7. The victim may be restless and perhaps confused and disoriented.

8. The arms, legs, face, or other parts of the body may be partially paralyzed.

9. The victim's face may be very pale, or may be unusually flushed.

10. The victim is likely to be suffering from shock, but the symptoms of shock may be disguised by other symptoms.

It is not necessary to determine whether or not the skull is fractured when you are giving first aid to a person who has suffered a head injury. The treatment is the same in either case, and the primary intent is to prevent further damage to the brain.

Treatment. Keep the victim lying down. If the face is flushed, raise the head and shoulders slightly. If the face is pale, have the victim lie so that the head is level with, or slightly lower than, the body. Watch carefully for vomiting. If the victim begins to vomit, position the head to prevent choking on the vomitus.

If there is serious bleeding from the wounds, try to control it by the application of direct pressure, using caution to avoid further injury to the skull or brain. Use a donut shaped bandage to gently surround protruding objects. (Never manipulate those objects.)

- Be very careful about moving or handling the victim. Move the victim no more than necessary. If transportation is necessary, keep the victim lying down.

- Examine the cervical spine for possible fracture whenever a skull fracture is suspected. Immobilization of the cervical spine may be indicated.

- Be sure that the victim is kept comfortably warm, but not too warm.

- Do NOT give the victim anything to drink. DO NOT GIVE ANY MEDICINES. See that the victim receives a medical officer's attention as soon as possible.

Fracture of the Spine

If the spine is fractured at any point, the spinal cord may be crushed, cut, or otherwise damaged so severely that death or paralysis will result. However, if the fracture occurs in such a way that the spinal cord is not seriously damaged, there is a very good chance of complete recovery—PROVIDED the victim is properly cared for. Any twisting or bending of the neck or back, whether due to the original injury or carelessness from handling later, is likely to cause irreparable damage to the spinal cord.

The primary symptoms of a fractured spine are pain, shock, and paralysis. PAIN is likley to be acute at the point of fracture. It may radiate to other parts of the body. SHOCK is usually severe, but (as in all injuries) the symptoms may be delayed for some time. PARALYSIS occurs if the spinal cord is seriously damaged. If the victim cannot move the legs, feet, or toes, the fracture is probably in the back; if the fingers will not move, the neck is probably broken. Remember, however, that a spinal fracture does not always injure the spinal cord, so the victim is not always paralyzed. Any person who has an acute pain in the back or the neck following an injury, should be treated as though there is a fractured spine, even if there are no other symptoms.

First-aid treatment for all spinal fractures, whether of the neck or of the back, has two primary purposes: (1) to minimize shock and (2) to prevent further injury to the spinal cord. Keep the victim comfortably warm. Do not attempt to keep the victim in the position ordinarily used for the treatment of shock, because it might cause further damage to the spinal cord. Just keep the victim lying flat and do NOT attempt to lower the head.

To avoid further damage to the spinal cord, DO NOT MOVE THE VICTIM UNLESS IT IS ABSOLUTELY ESSENTIAL. If life is threatened in the present location or transportation is necessary to receive medical attention, then of course you must move the victim. If movement is necessary, however, be sure that you do it in a way that will cause the least possible damage. DO NOT BEND OR TWIST THE VICTIM'S BODY, DO NOT MOVE THE HEAD FORWARD, BACKWARD, OR SIDEWAYS, AND DO NOT UNDER ANY CIRCUMSTANCES ALLOW THE VICTIM TO SIT UP.

If it is necessary to transport a person who has suffered a fracture of the spine, follow these general rules:

1. If the spine is broken at the NECK, the victim must be transported lying on the back, FACE UP. Place pillows or sandbags beside the head so that it cannot turn to either side. Do NOT put pillows or padding under the neck or head.

2. If you suspect that the spine is fractured but do not know the location of the break, treat the victim as though the neck is broken—that is, keep the victim supine. If both the neck and back are broken, keep the victim supine.

3. No matter where the spine is broken, USE A FIRM SUPPORT IN TRANSPORTING THE VICTIM. Use a rigid stretcher, or a door, shutter, wide board, etc. Pad the support carefully and put blankets both under and over the victim. Use cravat bandages or strips of cloth to fasten the victim firmly to the support.

4. Carefully slide or pull the victim onto the support while holding on to the clothing. DO NOT ATTEMPT TO LIFT THE VICTIM UNLESS YOU HAVE ADEQUATE ASSISTANCE. Remember, any bending or twisting of the body is almost sure to cause serious damage to the spinal cord. If there are at least four (preferably six) people present to help lift the victim, they can accomplish the job without too much movement of the victim's body, but a smaller number of people should NEVER attempt to lift the victim (fig. 4-61).

5. Evacuate the victim very carefully.

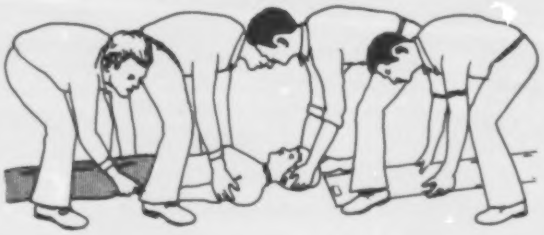

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Figure 4-61.—Moving spinal cord injury victim onto a backboard.

Fracture of the Pelvis

Fractures in the pelvic region often result from falls, heavy blows, and accidents that involve crushing. The great danger in pelvic fracture is that the organs enclosed and protected by the pelvis may be seriously damaged when the body structure is fractured. In particular, there is danger that the bladder will be ruptured. There is also danger of severe internal bleeding, because the large blood vessels in the pelvic region may be torn or cut by fragments of the broken bone.

The primary symptoms of a fractured pelvis are severe pain, shock, and loss of ability to use the lower part of the body. The victim is unable to sit or stand. If the victim is conscious, there may be a sensation of "coming apart." If the bladder is injured, the victim's urine may be bloody.

Treatment. Do not move the victim unless ABSOLUTELY necessary. The victim should be treated for shock and kept warm but should not be moved into the position ordinarily used for the treatment of shock.

If you must transport the victim to another place, do it with the utmost care. Use a rigid stretcher, a padded door, or a wide board. Keep the victim supine. In some cases the victim will be more comfortable if the legs are straight while in other cases the victim will be more comfortable with the knees bent and the legs drawn up. When you have placed the victim in the most comfortable position, immobilization should be accomplished as shown in figure 4-62. Fractures of the hip are best treated with

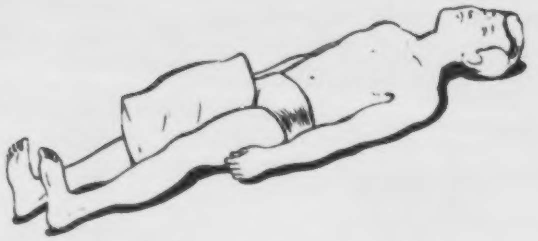

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Figure 4-62.—Immobilizing a fractured pelvis.

traction splints. Adequate immobilization can also be obtained by placing pillows or folded blankets between the legs and using cravats, roller bandages, or straps to hold the legs together. Fasten the victim securely to the stretcher or improvised support and evacuate very carefully.

INJURIES TO JOINTS AND MUSCLES

Injuries to joints and muscles often occur together, and sometimes it is difficult to tell whether the primary injury is to a joint or to the muscles, tendons, blood vessels, and nerves near the joint. Sometimes it is difficult to distinguish joint or muscle injuries from fractures. In case of doubt, ALWAYS treat any injury to a bone, joint, or muscle as though it were a fracture.

In general, joint and muscle injuries may be classified under four headings: (1) dislocation (2) sprains (3) strains; and (4) contusions (bruises).

Dislocations

When a bone is forcibly displaced from its joint, the injury is known as a DISLOCATION. In some cases the bone slips back quickly into its normal position, but in other cases it becomes locked in the new position and remains dislocated until it is put back into place. Dislocations are usually caused by falls or blows but occasionally by violent muscular exertion. The most frequently dislocated joints are those of the shoulder, hip, finger, and jaw.

A dislocation is likely to bruise or tear the muscles, ligaments, blood vessels, tendons, and nerves near the joint. Rapid swelling and discoloration, loss of ability to use the joint, severe pain and muscle spasms, possible numbness and loss of pulse below the joint, and shock are characteristic symptoms of dislocations. The fact that the injured part is usually stiff and immobile, with marked deformation at the joint, will help you distinguish a dislocation from a fracture. (In a fracture, there is deformity BETWEEN joints rather than AT joints, and there is generally a wobbly motion of the broken bone at the point of fracture.)

As a general rule, you should NOT attempt to reduce a dislocation—that is, put a dislocated bone back into place—unless you know that a medical officer cannot be reached within 8 hours. Unskilled attempts at reduction may cause great damage to nerves and blood vessels or actually fracture the bone. Therefore, except in great emergencies, you should leave this treatment to medical personnel and concentrate your efforts on making the victim as comfortable as possible under the circumstances.

The following first aid measures will be helpful:

1. Loosen the clothing around the injured part.
2. Place the victim in the most comfortable position possible.
3. Support the injured part by means of a sling, pillows, bandages, splints, or any other device that will make the victim comfortable.
4. Treat the victim for shock.
5. Get medical help as soon as possible.

You should NEVER attempt to reduce the more serious dislocations, such as those of the hip. However, if it is probable that the victim cannot be treated by a medical officer within a REASONABLE TIME, you should make a careful effort to reduce certain dislocations, such as those of the jaw, finger, or shoulder IF there is no arterial or nerve involvement (pulse is palpable and there is no numbness below the joint).

Dislocation of the Jaw. When the lower jaw is dislocated, the victim cannot speak or close the mouth. Dislocation of the jaw is usually caused by a blow on the mouth; sometimes it is caused by yawning or laughing. This type of dislocation is not always easy to reduce, and there is considerable danger that the operator's thumbs will be bitten in the process. For your own protection, wrap your thumbs with a handkerchief or bandage. While facing the victim, press your thumbs down just behind the last lower molars and, at the same time, lift the chin up with your fingers. The jaw should snap into place at once; you will have to remove your thumbs quickly in order to avoid being bitten. No further treatment is required, but you should warn the victim to keep the mouth closed as much as possible during the next few hours.

Figure 4-63 shows the position you must assume to reduce a dislocated jaw.

Dislocation of the Finger. The joints of the finger are particularly susceptible to injury, and even minor injuries may result in prolonged loss of function. Great care must be used in treating any injury of the finger.

To reduce a dislocation of the finger, grasp the finger firmly and apply a steady pull in the same line as the deformity. If it does not slip into position, try it again, but if it does not go into position on the third attempt, DO NOT TRY AGAIN. In any case, whether or not the dislocation is reduced, the finger should be strapped, slightly flexed, with an aluminum splint or with a roller gauze bandage over a tongue blade. Figure 4-64 shows how a dislocated finger can be immobilized by strapping it to a flat, wooden stick, such as a tongue depressor.

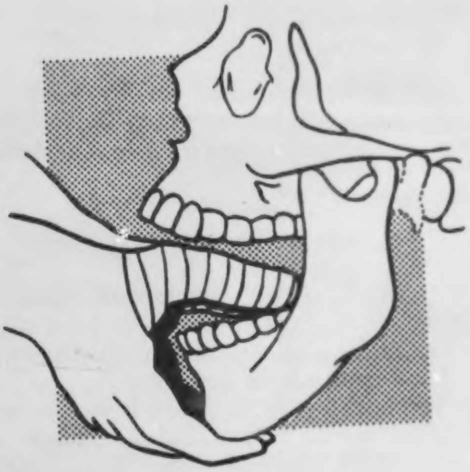

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Figure 4-63.—Position for reducing a dislocated jaw.

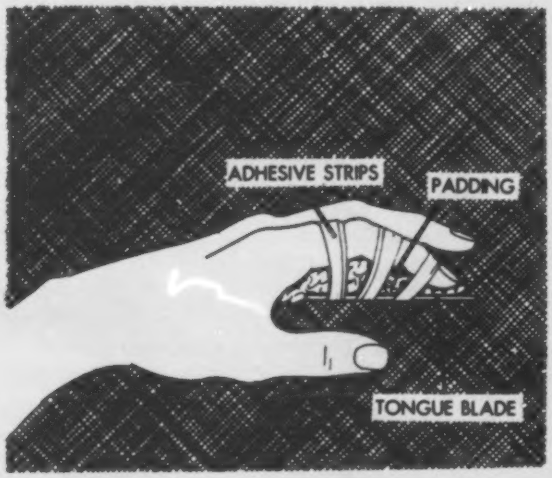

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Figure 4-64.—Immobilizng a dislocated finger.

Dislocation of the Shoulder. Before reduction, place the victim in a supine position. After putting the heel of your foot in the victim's armpit, grasp the wrist and apply steady traction by pulling gently and increasing resistance gradually. Pull the arm in the same line as it is found. After several minutes of steady pull, flex the victim's elbow slightly. Grasp the arm below the elbow and apply traction from the point of the elbow and gently rotate the arm into the external or outward position. If three reduction attempts fail, carry the forearm across the chest and apply a sling and swathe. An alternate method involves having the patient lie face down on an examining table with the injured arm hanging over the side. Apply prolonged firm gentle traction at the wrist with gentle external rotation. A water bucket with padded handle placed in the crook at the patient's elbow may be substituted.

Gradually add sand or water to the bucket. Treat all other dislocations as fractures, and evacuate the victim to a definitive care facility.

Sprains

A SPRAIN is an injury to the ligaments and soft tissues that support a joint. A sprain usually involves a momentary dislocation, with the bone slipping back into place of its own accord. A sprain is caused by the violent wrenching or twisting of the joint beyond its normal limits of movement. Although any joint may be sprained, sprains of the ankle, wrist, knee, and finger are most common.

Symptoms of a sprain include pain or pressure at the joint, pain upon movement, swelling and tenderness, possible loss of movement, and discoloration.

Emergency care for a sprain includes application of cold packs to reduce swelling for the first 24-48 hours and to control internal hemorrhage; elevation and rest of the affected area; application of a snug, smooth, figure-of-eight bandage to control swelling and for immobilization (basket-weave adhesive bandages can be used on the ankle); a follow-up examination by a medical officer; and x-rays to rule out the presence of a fracture. Note: Check bandaged areas regularly for swelling that might cause circulation impairment; loosen bandages if necessary. After the swelling stops (24-48 hours) moist heat can be applied for short periods (15-30 minutes) to promote healing and reduce swelling. Moist heat can be warm, wet compresses, warm whirlpool baths, etc.

Strains

An injury caused by the forcible overstretching or tearing of a muscle or tendon is known as a STRAIN. Strains may be caused by lifting excessively heavy loads, sudden or violent movements, or any other action that pulls the muscles beyond their normal limits.

The chief symptoms of a strain are pain, lameness or stiffness (sometimes involving knotting of the muscles), moderate swelling at the place of injury, discoloration due to the escape of blood from injured blood vessels into the tissues, possible loss of power, and a distinct gap felt at the site.

Treatment. Keep the affected area elevated and at rest; apply cold packs for the first 24-48 hours to control hemorrhage and swelling; after the swelling stops, mild heat may be applied to increase circulation and aid healing. Muscle relaxants, adhesive straps, and complete immobilization of the area may be indicated. Evacuate the victim to a medical facility where X-rays can be taken to rule out the presence of a fracture.

Contusions

CONTUSIONS, commonly called BRUISES, are responsible for the discoloration that almost always accompanies injuries to bones, joints, and muscles. Contusions are caused by blows that damage bones, muscles, tendons, blood vessels, nerves, and other body tissues, although they do not necessarily break the skin.

The symptoms of a contusion or bruise are familiar to everyone. There is immediate pain when the blow is received. Swelling occurs because blood from the broken blood vessels oozes into the soft tissues under the skin. At first the injured place is reddened due to local skin irritation from the blow; later the characteristic "black and blue" marks appear; and finally, perhaps several days later, the skin is yellowish or greenish. The bruised area is usually very tender.

Treatment. As a rule, slight bruises do not require treatment. However, if the victim has severe bruises, treat for shock.

Immobilize the injured part, keep it at rest, and protect it from further injury. Sometimes the victim will be more comfortable if the bruised area is bandaged firmly with an elastic or gauze bandage.

If possible, elevate the injured part. A sling may be used for a bruised arm or hand. Pillows or folded blankets may be used to elevate a bruised leg.

Apply COLD cloths or an ice bag to a fresh bruise.

CAUTION: Extensive bruises may be very serious. In such cases, always get medical attention for the victim as soon as possible.

POISONS AND DRUG ABUSE

A poison is a substance that, when taken into the body, produces a harmful effect on normal body structures or functions. Poisons come in solid, liquid, and gaseous forms and may be ingested, inhaled, absorbed, or injected into the system. Children are most susceptible to toxic substances, but as a hospital corpsman you must also be prepared to respond to the accidental or intentional poisoning of adult victims. The handling of drug abuse cases will be covered at the end of this section.

Obtaining Information

As a general rule, your first contact, whether on the phone or in person, with a suspected poisoning victim or the victim's relatives or friends, will be complicated by excitement, especially if you are dealing with a parent. It is absolutely essential that you be calm, professional, and systematic if you are to be able to elicit all the essential information you will need.

The first priority is to identify the poison. If the poisoning was not witnessed, and the victim cannot or will not identify the agent, it becomes necessary to obtain the container that held the poison. A commerical label on the container should identify the name of the product, the ingredients, and the antidote to any toxic substances it contains. If there is no label or if you suspect that the container held an unidentified substance other than that listed on the side, send the container along with the victim to the hospital for lab analysis.

The second priority is to determine the quantity of poison taken. Once again, if the victim cannot or will not provide the information, the container must be checked. Whatever is not in the container is normally considered to be in the victim, unless someone familiar with the container can verify the quantity previously used up.

The third priority is to determine as closely as possible the time the poisoning occurred. If it was not witnessed, careful questioning of bystanders and the victim may be needed to approximate the time.

The fourth priority is to establish as accurately as possible the victim's symptoms and medical history. The symptoms will give you a good idea of the severity of the poisoning and its progression. They will also give you a clue as to whether the victim has taken any additional poisons. The medical history can establish if this is a repeat poisoning and if the victim has any illnesses or is using medications that may contraindicate certain methods of treatment.

Quick systematic questioning will give basic information about the poison and the victim's condition. Additional information about the toxic ingredients of almost every commerical product, along with recommended antidotes and treatments, is readily available through poison control centers at medical facilities throughout the country. Area centers are listed near the front of every telephone directory. Also, be familiar with your command's antidote locker and poison chart. With all this information in hand, a medical professional will be able to quickly assess the situation and plan and implement a course of treatment.

General Treatment

In most situations the treatment of a poisoning victim will be under the direction of a medical officer; however, in isolated situations, a hospital corpsman must be ready to treat the victim.

Poisoning should be suspected in all cases of sudden, severe, and unexpected illness. Once poisoning has been established, the general rule is to quickly remove as much of the toxic substance from the victim as possible. For absorbed poisons, this primarily means cleansing the skin; for inhaled poison, oxygen ventilation is the method of choice; for injected poisons, medications are recommended; and for most ingested poisons, there is a choice between emetics and gastric lavage.

Ingested Poisons

Noncorrosives

The many different noncorrosive substances have the common characteristic of irritating the stomach. They produce nausea, vomiting, convulsions, and severe abdominal pain. The victim may complain of a strange taste, and the lips, tongue, and mouth may look different than normal. Shock occurs in severe cases. Examples of noncorrosives are listed in table 4-4.

Table 4-4.—Common Stomach Irritants and Possible Sources of Contact

Irritant	Source of Contact
Arsenic	Dyes, insecticides, paint, printer's ink, wood preservatives
Copper	Antifoulant paint, batteries, canvas preservative, copper plating, electroplating, fungicides, insecticides, soldering, wood preservatives
Iodine	Antiseptics
Mercury	Bactericides, batteries, dental supplies and appliances, disinfectants, dyes, fungicides, ink, insecticides, laboratories, photography, wood preservatives
Phosphorus	Incendiaries, matches, pesticides, rat poison
Silver nitrate	Batteries, cleaning solutions, ink, photographic film, silver polish, soldering
Zinc	Disinfectants, electroplating, fungicides, galvanizing, ink, insecticides, matches, metal plating and cutting, paint, soldering, wood preservatives

Treatment

First aid for most forms of noncorrosive poisoning centers on quickly emptying the stomach of the irritating substance. The following steps are suggested:

1. Maintain an open airway. Be prepared to give artificial ventilation.

2. Dilute the poison by having the conscious victim drink one to two glasses of water or milk.

3. Empty the stomach, using emetics or gastric lavage.

    a. Giving an emetic is a preferred method for emptying the contents of the stomach. It is quick and can be used in almost every situation when the victim is conscious, except in cases of caustic or petroleum distillate poisoning, or when an antiemetic has been ingested. In most situations a hospital corpsman will have access to syrup of Ipecac, which can be given in a 15 ml (tsp) oral dose, repeated in 20 minutes if the first dose is nonproductive. In an emergency room the medical officer can rapidly induce vomiting by the injection of various medications. If nothing else is available, tickle the back of the victim's throat with your finger or a blunt object to induce vomiting.

    b. Trained personnel may use gastric lavage by itself, or after two doses of ipecac syrup have failed to induce vomiting. After passing a large caliber nasogastric tube, aspirate the stomach contents. Next, instill 100 ml of normal saline into the stomach, then aspirate it out again. Continue this flushing cycle until the returning fluid is clear. Gastric lavage is preferred when the victim is unconscious, or subject to seizures, as in strychnine poisoning.

4. Collect the vomitus for lab analysis.

5. Soothe the stomach with milk or milk of magnesia.

6. Transport the victim to a definitive care facility if symptoms persist.

Table 4-5.—Examples of common acids, alkalis, and phenols with possible sources of contact

AGENT	SOURCES OF CONTACT
ACIDS	
Hydrochloric	Electroplating, metal cleaners, photoengraving
Nitric	Industrial cleaners, laboratories, photoengraving, rocket fuels
Oxalic	Cleaning solutions, paint and rust removers, photo developer
Sulfuric	Auto batteries, detergents, dyes, laboratories, metal cleaners
ALKALIES	
Ammonia	Galvanizers, household cleaners, laboratories, pesticides, rocket fuels
Lime	Brick masonry, cement, electroplating, insecticides, soap, water treatment
Lye	Bleaches, degreasers, detergents, laboratories, paint and varnish removers
PHENOLS	
Carbolic	Disinfectants, dry batteries, paint removers, photo materials, wood preservatives
Creosol	Disinfectants, ink, paint and varnish removers, photo developer, stainers
Creosote	Asbestos, carpentry, diesel engines, electrical shops, furnaces, lens grinders, painters, waterproofing, wood preservatives

Corrosives

Acids and alkalies produce actual chemical burning and corrosion of the tissues of the lips, mouth, throat, and stomach. Acids do most of their damage in acidic stomach environment, while alkalies primarily destroy tissues in the mouth and throat. Stains and burns around the mouth and the presence of characteristic odors provide clues to corrosive poisoning. Swallowing and breathing may be difficult, especially if any corrosive was aspirated into the lungs. The abdomen may be tender and swollen with gas. Examples of corrosive agents, and sources of contact, are listed in Table 4-5.

Treatment

DO NOT INDUCE VOMITING. The caustic damage to the mouth and esophagus will be doubled. In addition, the treatment of aspiration during vomiting is too great. Gastric lavage could cause perforation of the stomach, therefore, use it only on a doctor's order. First aid consists of neutralizing and diluting the corrosive and keeping alert for airway patency and shock.

1. Dilute acids by having the victim drink two glasses of milk or water. Follow this with milk of magnesia or antacids every few hours for 24 hours to neutralize the substances. DO NOT use bicarbonate of soda because the gas generated by it may cause perforation.
2. Dilute and neutralize alkalies with large amounts of lemon or orange juice or a mixture of equal parts of vinegar and water.
3. After neutralizing the poison soothe the gastrointestinal tract with milk, raw eggs, or other bland foods, along with an antacid.
4. Consult a medical officer concerning the need for chest x-rays, steroids, antibiotics, and any additional medical therapy.

Petroleum Distillates

Volatile petroleum products such as kerosene, gasoline, turpentine, and related petroleum products such as red furniture polish, usually cause severe chemical pneumonia as well as other toxic effects in the body. Symptoms include abdominal pain, choking, gasping, vomiting, and fever. Often these products may be identified by their characteristic odor. Mineral oil and motor oil are not as serious, since they usually do nothing more than cause diarrhea.

Treatment

DO NOT INDUCE VOMITING unless told to do so by a physician or poison control center. Vomiting may cause additional poison to enter the lungs. However, the quantity of poison swallowed or special petroleum additives may make gastric lavage or the use of cathartics advisable.

1. If a physician or poison control center cannot be reached, give the victim 30 to 60 ml of vegetable oil.

2. Transport the victim immediately to a medical facility.

Shellfish and Fish Poisoning

Mussels, clams, oysters, and other shellfish often become contaminated with bacteria during the warm months of March to November. Numerous varieties of shellfish should not be eaten at all, so wherever you serve in the world, learn which local seafoods are known to be safe.

Most fish poisoning occurs with fish that normally are considered safe to eat, but which become poisonous at different times of the year from eating poisonous algae and plankton (red tide) that appear in certain locations. Examples of fish that are always poisonous are shown in figure 4-65.

The symptoms of shellfish and fish poisoning are tingling and numbness of the face and mouth, muscular weakness, nausea and vomiting, increased salivation, difficulty in swallowing, and respiratory failure.

Treatment

If the victim has not vomited, cause him or her to do so. Use Syrup of Ipecac, gastric lavage, or manual stimulation; then administer a cathartic. If respiratory failure develops, give artificial ventilation and treat for shock.

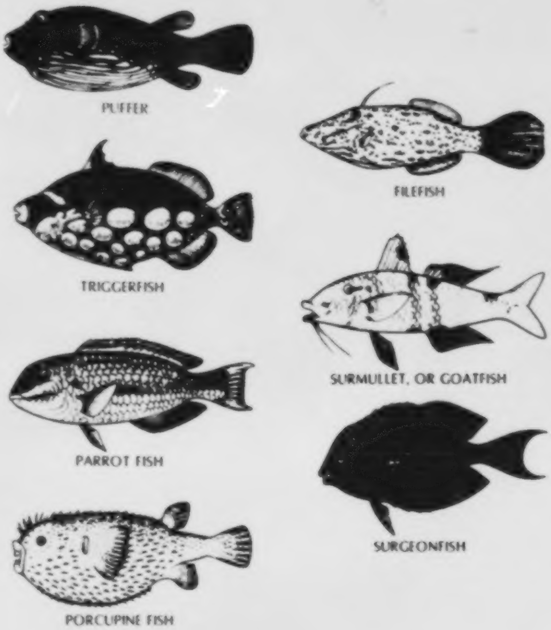

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Figure 4-65.—Poisonous fish.

Poisons by Inhalation

In the Navy, many industrial processes are carried out. The problem of poisoning by inhalation is widespread. The irritants and corrosives mentioned in tables 4-4 and 4-5 are more often a source of poisoning by means of inhalation rather than ingestion. The handling of large quantities of petroleum products (fuel oil and gasoline, in particular), constitutes a special hazard, since all of these products give off poisonous vapors.

Other poisonous gases are by-products of certain operations or processes: exhaust gases from internal combustion engines; fumes or vapors from materials used in casting, molding, welding, or plating; gases associated with bacterial decomposition in closed spaces; and gases that accumulate in voids, double bottoms, empty fuel tanks, and similar places. Carbon monoxide is the most common agent of gas poisoning. It is present in exhaust gases of internal-combustion engines as well as in sewer gas, lanterns, charcoal grills, and in manufactured gas used for heating and cooking. It gives no warning of its presence since it is completely odorless and tasteless. The victim may lose consciousness and suffer respiratory distress with no warning other than slight dizziness, weakness, and headache. The lips and skin of a victim of carbon monoxide poisoning are characteristically cherry red. Death may occur within a few minutes. Other sources of chemical poisoning are listed in Table 4-6.

Most inhalation poisoning causes shortness of breath and coughing. The victim's skin will turn blue. If the respiratory problems are not corrected, cardiac arrest may follow.

Table 4-6.—Sources of inhalation poisoning

Inhalant	Source of contact
Carbon dioxide	Wells and sewers
Carbon monoxide	Fires, lightning, heating and fuel exhausts
Carbon tetrachloride trichlorethylene	Solvents in dry cleaning fluid, electrical equipment cleaners, degreasing agents, and fire extinguishers
Chemical warfare agents	Tear, nerve, blister, and vomiting gases, screening smokes, thermite and magnesium incendiary substances, hydrocyanic acid and other systemic poisons
Chlorine	Water purification
Ether, chloroform, nitrous oxide, and cyclopropane	Ice making and refrigeration units

Treatment

Remove the victim from the toxic atmosphere immediately. (WARNING) Never try to remove a victim from the toxic environment if you do not have the proper protective mask or breathing apparatus or if you are not trained in its use. Too often, well intentioned rescuers become victims. When in doubt, call for trained rescue personnel. If help is not immediately available, and if you know you can reach and rescue the victim, take a deep breath, hold it, enter the area, and pull the victim out.

Next:

1. Start basic life support as outlined in the first section of this chapter.

2. Remove or decontaminate the clothing if chemical warfare agents or volatile fuels were the cause.

3. Keep the victim quiet, treat for shock, and administer oxygen.

4. Transport the victim to a medical facility for further treatment.

Absorbed Poisons

Some substances may cause tissue irritation or destruction by contact with the skin, eyes, and lining of the nose, mouth, and throat. These substances include acids, alkalies, phenols, and some chemical warfare agents. Direct contact with these substances will cause inflammation or chemical burns in the affected areas. Consult the chemical burns section of this chapter and the chemical agents section of the CBR chapter for treatment.

Injected Poisons

Injection of venom by stings and bites from various insects, while not normally life-threatening, can cause an acute allergic reaction that can be fatal. Poisons may also be injected by snakes and marine animals.

Bee, Wasp, and Fire Ant Stings:

Stings from bees, wasps, and ants account for more poisonings than stings from any other insect group. Fortunately, they rarely result in death. The vast majority of stings cause a minor local reaction of pain, redness, itching, and swelling at the injection site. These symptoms usually fade after a short time.

A small percent of these stings cause a severe anaphylactic reaction presenting itching, swelling, weakness, headache, difficulty in breathing, and abdominal cramps. Shock may follow quickly and death may occur.

Treatment

1. Closely monitor vital signs and remove all rings, bracelets, and watches.

2. Remove stingers by scraping with a dull knife (pulling forces venom remaining in the sac into the wound).

3. Place an ice cube or analgesic-corticosteroid lotion over the wound site to relieve pain.

4. For severe reactions, apply a constricting band above the injured site at the edge of the swelling. Advance it as needed.

5. For severe allergic reactions, immediately give the victim a subcutaneous injection of 1:1000 aqueous solution of epinephrine. Dosage ranges from 0.2 to 0.3 cc for children to 0.5 cc for adults.

6. Patients with severe allergic reactions should be evacuated to a medical facility.

Scorpion Stings

The only North American scorpion of medical importance is the type called Centruroides sculpturatus found in Mexico and certain areas of the American Southwest. Its sting causes severe pain and some weakness in the affected area. It may also cause vomiting, visual disturbances, and circulatory and respiratory depression.

Treatment

1. Place ice over the sting site.
2. Under a medical officer's direction, severe pain can be controlled by rapid-acting barbiturates given intramuscularly or intravenously, or by 10 ml of calcium gluconate (10% solution) given intravenously.
3. A scorpion antivenin is available for severe cases.
4. Keep the victim under observation and be prepared to give symptomatic supportive care.

Spider Bites

Spiders in the United States are generally harmless, with several exceptions. The most notable are the black widow and brown recluse spiders. Their bites are serious but rarely fatal.

The female black widow spider is usually identified by the hour glass shaped red spot in its belly (see fig. 4-66). Its bite causes a dull, numbing

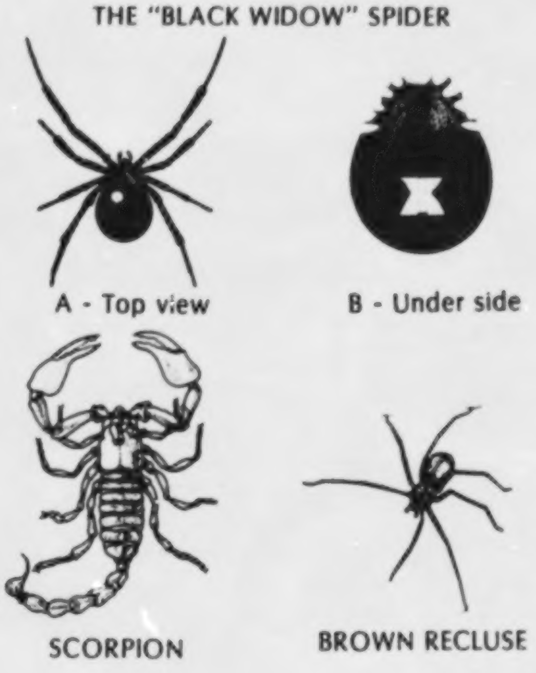

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Figure 4-66.—Black widow and brown recluse spiders and scorpion.

pain, which gradually spreads from the region of the bite to the muscles of the entire torso. The pain becomes severe, and a board-like rigidity of the abdominal muscles is common. Nausea, vomiting, headache, dizziness, difficulty in breathing, edema, rash, hypertension, and anxiety are frequently present. The bite site can be very hard to locate, since there is little or no swelling at the site, and the victim may not be immediately aware of having been bitten. The buttocks and genitalia should be carefully examined for a bite site if the suspected victim has recently used an outside latrine.

Treatment

1. Place ice over the bite to reduce pain.
2. Hospitalize victims who are under 16 or over 65 for observation.
3. Be prepared to give antivenim in severe cases.

The brown recluse spider (fig. 4-66) is identified by its violin shaped marking. Its bite may initially go unnoticed, but after several hours a bleb develops over the site, and rings of erythema begin to surround the bleb. Other symptoms include skin rash, fever and chills, nausea and vomiting, and pain. A progressively enlarging necrotic ulcerating lesion eventually develops.

Treatment

1. Early diagnosis is important since, within the first 8 hours, a medical officer has the option of excising the lesion and starting corticosteriod therapy.
2. The lesion should be debrided, cleansed with peroxide, and soaked with Burrow's solution three times daily.
3. Apply polymixin-bacitracin-neomycin ointment, and cover the lesion with a sterile dressing.

Snakebites

Poisonous snakes are found throughout the world, primarily in the tropical and temperate regions. Within the United States there are 20 species of poisonous snakes. They can be grouped into two families, the Crotalidae (Rattlesnakes, copperheads, and moccasins) and the Elapidae (coral snakes).

Identification

The crotalidae are called pit vipers because of the small, deep pits between the nostrils and the eyes (fig. 4-67). They have two long hollow

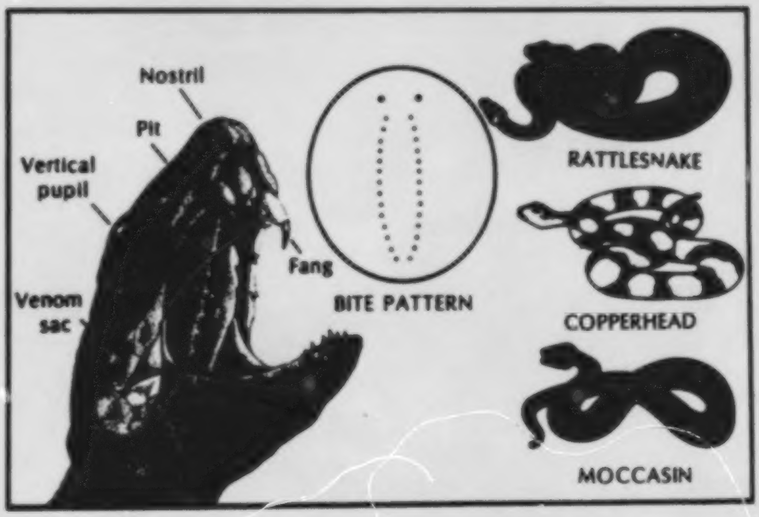

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Figure 4-67.—American pit vipers.

fangs, which normally are folded against the roof of the mouth, but which can be extended by a swivel mechanism when they strike. Other identifying features include thick bodies, slit like pupils of the eyes, and flat triangular heads. Further identification is provided by examining the wound for signs of fang entry in the bite pattern shown in figure 4-67. Individual identifying characteristics include audible rattles on the tails of most rattlesnakes, and the cotton white interior of the mouths of moccasins. These snakes are found in every state except Maine, Alaska, and Hawaii.

Coral snakes are releated to the cobra, kraits, and mamba snakes in other areas of the world (fig. 4-68). Corals, which are found in the Southeastern United States, are comparatively thin snakes with small bands of red, black, and yellow (or almost white). Other nonpoisonous snakes have the same coloring, but in the coral snake the red band always touches the yellow band. Its short, grooved fangs must chew into its victim before the poison can be introduced. The bite pattern is shown in figure 4-68.

In a snakebite situation, every reasonable effort should be made to kill or at least to positively identify the culprit, since treatment of a nonpoisonous bite is far simpler and less dangerous to the victim than treatment of a poisonous bite.

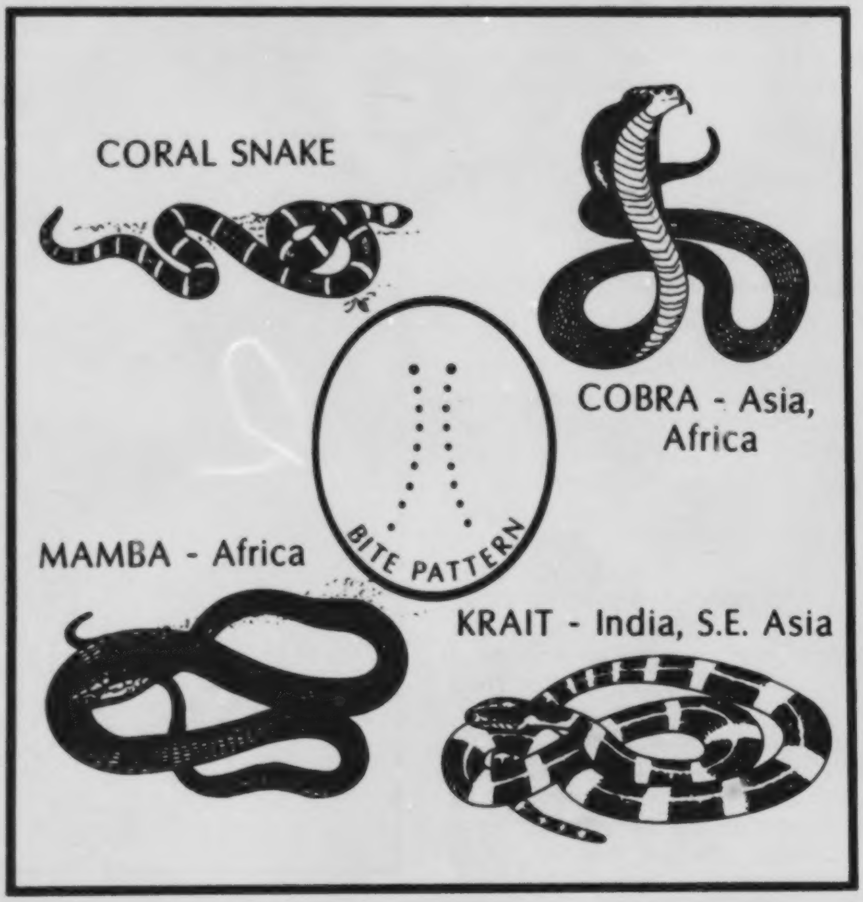

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Figure 4-68.—Corals, cobras, kraits, and mambas.

Venom

Snake venom is a complex mixture of enzymes, peptides, and other substances. A single injection can cause many different toxic effects in many areas of the body. Some of these effects are felt immediately while the action of other venom components may be delayed for hours or even days. A poisonous bite should be considered a true medical emergency until symptoms prove otherwise.

The venom is stored in sacs in the snakes head. It is introduced into a victim through hollow or grooved fangs. An important point to remember, however, is that a bitten patient has not necessarily received a dose of venom. The snake can control whether or not it will release the poison and how much it will inject. As a result, while symptoms in a poisonous snakebite incident may be severe, they may also be mild or not develop at all.

Diagnosis

It is essential that you be able to quickly diagnose a snake bite as being envenomated or not.

Usually enough symptoms present themselves within an hour of a poisonous snakebite to erase any doubt. The victim's condition provides the best information as to the seriousness of the situation. The bite of the pit viper is extremely painful and is characterized by immediate swelling and edema about the fang marks, usually within 5 to 10 minutes, spreading and possibly involving the whole extremity within an hour. If only minimal swelling occurs within 30 minutes, the bite will almost certainly have been from a nonpoisonous snake, or from a poisonous snake that did not inject venom. When the venom is absorbed, there is general discoloration of the skin due to the destruction of blood cells. This reaction is followed by blisters and numbness in the affected area. Other signs that may occur are weakness, rapid pulse, nausea, shortness of breath, vomiting, shock, headache, fever, chills, drop in blood pressure, and blurred vision. Severe poisoning can cause pulmonary edema and internal bleeding. The eastern diamondback rattler bite is further characterized by numbness and tingling of the mouth and possibly also of the face and scalp. A metallic taste on the tongue may be noted.

First Aid

The aim of first aid for envenomated snakebites is to reduce the circulation of blood through the bite area, to delay absorption of venom, to prevent aggravation of the local wound, to maintain vital signs, and to transport the victim as soon as possible to a medical facility. Other aid will be mainly supportive:

1. Wrap a constricting band (rubber tubing, belt, necktie, stocking, etc.) 2-3 inches above the fang marks, or above the nearest

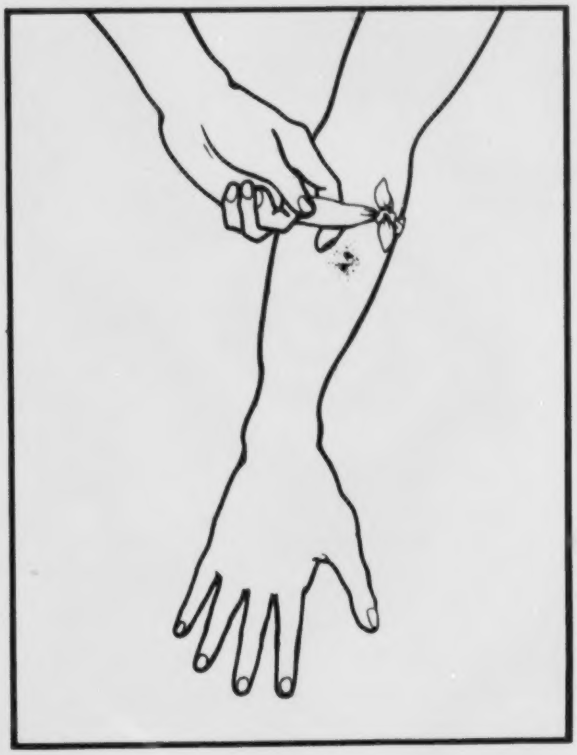

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Figure 4-69.—Properly applied constricting band.

proximal joint, but away from the swelling. It should be tight enough to stop the flow of blood in the veins but not tight enough to shut off the arterial blood supply (fig. 4-69). The victim's pulse should be countable below the band. Advance the constricting band to keep ahead of the swelling.

2. If the victim cannot reach a medical facility within 30 minutes of the time of the bite, and IF there are already definite signs of poisoning, use a sterile knife blade to make an incision about 1/2 inch long and 1/4 inch deep lengthwise over each fang mark. Apply suction cups to help remove some of the injected venom. Suction by mouth is recommended only as a last resort, because the human mouth contains so many different bacteria that the bite could become infected. Incision and suction later than 30 minutes from the time of the bite is not recommended.

3. Check pulse and respiration frequently. Give artificial ventilation if necessary.

4. Calm and reassure the victim, who will often be excited or hysterical. Keep the victim lying down, quiet, and warm. DO NOT give alcohol or any other stimulant to drink.

5. Treat for shock.

6. Use a splint to immobilize the victim's effected extremity, keeping the involved area at or below the level of the heart.

7. Cover the wound to prevent further contamination.

8. Give aspirin for pain.

9. Telephone the nearest medical facility so that the proper antivenin can be made available.

10. Transport the victim (and the dead snake) to a medical facility as soon as possible.

Treatment of a nonenvenomated snakebite is essentially the same as the treatment for puncture wounds.

Definitive Care

In most situations the definitive care of the victim will be in the hands of a medical officer. This care will center around the use of antivenin serum. All western hemisphere snakes, with the exception of the eastern coral snake, can be treated with the same polyvalent antivenin. This is given in doses of 3 vials for small reactions; 5-8 vials for cases in which there is swelling of a hand or foot; and at least 8 vials for moderate or severe envenomation. Extra vials are kept at the ready. Children will receive higher doses than adults since the poison has more effect on them because of their smaller size and lower weight.

Because the antivenin is a horse serum base, the medical officer will order a sensitivity test before it is given. Routine lab tests will also be run in preparation for the possible start of whole blood infusion.

Additional medical facility care would include tetanus prophylaxis, wound cleansing and debridement, Burrow's solution soaks, antiseptic ointment, and sterile dressing.

Bites, Stings, and Punctures from Sea Animals

A number of sea animals are capable of inflicting painful wounds by biting, stinging, or puncturing. Except under rare circumstances, these stings and puncture wounds are not fatal. Major wounds from sharks, barracuda, moray eels, and alligators can be treated by controlling the bleeding, preventing shock, giving basic life support, splinting the injury, and transporting the victim to a medical facility. Minor injuries inflicted by turtles and stinging corals require only that the wound be thoroughly cleansed and the injury splinted.

Other sea animals inflict injury by means of stinging cells located in tentacles. This group includes the jellyfish and Portuguese man-of-war (fig. 4-70). Contact with the tentacles produces burning pain, a rash with small hemorrhage in the skin, and on occasion, shock, muscular cramping, nausea, vomiting, and respiratory

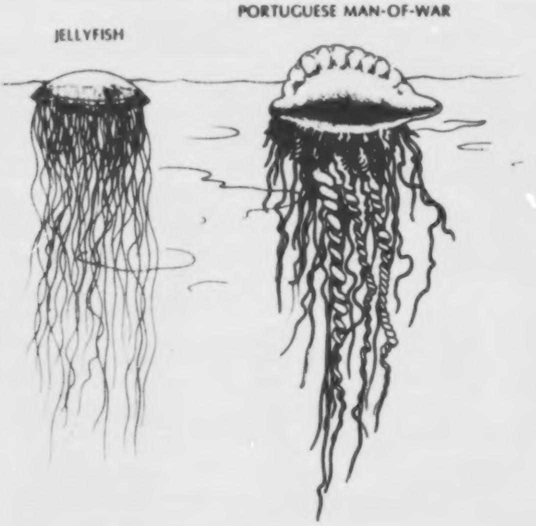

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Figure 4-70.—Jellyfish and Portuguese Man-of-war.

distress. Treatment consists of pouring sea water over the injured area and then removing the tentacles with a towel or gloves. Next, pour rubbing alcohol, formalin, vinegar, or diluted ammonia over the effected area to neutralize any remaining nematocysts (minute stinging structures). Finally, cover the area with a dry powder, to which the last nematocysts will adhere, and then scrape them off with a dull knife.

Spiny fish, stingrays, urchins, and cone shells inject their venom by puncturing with spines (fig. 4-71). General signs and symptoms include swelling, nausea, vomiting, generalized cramps, diarrhea, muscular paralysis, and shock. Emergency care consists of prompt flushing with cold sea water to remove the venom and to constrict hemorrhaging blood vessels. Next, debride the wound of any remaining pieces of the spine's venom-containing integumentary sheath. Soak the wound area in very hot water for 30 to 60 minutes to neutralize the venom. Finally, completely debride the wound, control hemorrhage, suture, provide tentanus prophylaxis and a broad-spectrum antibiotic, and elevate the extremity.

Sea snakes are found in the warm water areas of the Pacific and Indian Ocean. Their venom is VERY poisonous, but their fangs are only 1/4-inch long. It is advisable to follow the first aid steps outlined for the treatment of land snake bites.

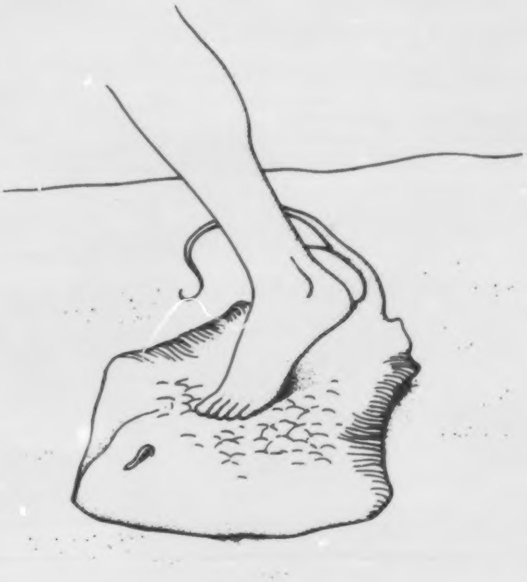

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Figure 4-71.—Stingray sting.

DRUG ABUSE

Drug abuse is the habitual or excessive use of drugs for purposes or in quantities for which they were not intended.

Drugs are chemical compounds or biological substances which, when introduced into the body, affect its mental or physical functions. When abused, drugs become a source of "poison" to the body. They can lead to serious illness, dependency, and death. Death is usually due to acute intoxication or overdose.

The group classification used in this manual is intended to categorize drugs most commonly abused into useful clusters. For our purposes it is considered the most appropriate of several methods of classification. Table 4-7 lists the drugs with their recognized trade names, commonly used street names, and observable symptoms of abuse.

Table 4-7.—Classification of Abused Drugs

Group/Agent	Trade Name	Some Street Names	Symptoms of Abuse
A. NARCOTICS			
Morphine	....	H, Miss Emma, Smack	Lethargy, drowsiness, confusion, euphoria, slurred speech, flushing of the skin on face, neck, and chest, nausea and vomiting, pupils constricted to pinpoint size.
Diacetylmorphine	Heroin	H, Horse, Harry	
Codeine	....	Schoolboy	
Meperidine	Demerol		
Methadone	Dolphine	Dollies	
Propoxyphene	Darvon		
Pentazocine	Talwin		
B. ALCOHOL			
(Ethyl)	Ethanol	Whiskey, burbon, rye, beer, wine, cocktail	Slurred speech, incoordination, confusion, tremors, drowsiness, agitation, nausea and vomiting, respiratory depression, hallucinations, possibly coma.
C. BARBITURATES	....	Downers	Same as those noted in alcohol intoxication plus pupils may be dilated.
Phenobarbital	....	Pheenies	
Amobarbital	Amytal	Blues, blue birds	
Pentobarbital	Nembutal	Yellows, yellow jackets	
Secobarbital	Seconal	Reds, red devils, seggy	
D. OTHER SEDATIVES & HYPNOTICS	....	Downers	Same as those noted in alcohol and barbiturate intoxication
Glutethimide	Doriden		
Chlordiazepoxide	Librium		
Meprobamate	Miltown, Equanil		
E. STIMULANTS	....	Uppers	Excitability, rapid and unclear speech, restlessness; tremors; sweating; dry lips and mouth; dilated pupils; loss of consciousness; coma and hallucination
Amphetamine	Dexedrine	Cartwheels, bennies	
Dextroamphetamine	Dexedrine		
Methamphetamine	Methedrine	Speed, meth, crystal crank	
Methylphenidate	Ritalin		
F. HALLUCINOGENS			Trance like state; anxiety, confusion; tremors; euphoria; depression; hallucinations; psychotic manifestations; suicidal or homicidal tendencies
Lysergic acid diethylamide		LSD, acid	
Mescaline			
Psilocin, psilocybin	Peyote	Buttons	

Table 4-7.—Classification of Abused Drugs—Continued

Group/Agent	Trade Name	Some Street Names	Symptoms of Abuse
G. CANNIBIS	Marijuana	Pot, grass, weed, joint, tea, reefer, rope, Jane, hay	Euphoria, excitability, increased appetite, dryness of mouth, odor of burned rope on breath, intoxication, laughter, mood swings, increase in heart rate, reddening of eyes, loss of memory, distortion of time and spatial perception

The following sections contain specific information about commonly abused drugs, as classified in Table 4-7, including availability and methods of administration.

Narcotic Intoxication

Unfortunately abuse of narcotic drugs is common. This group of drugs include the most effective and widely used pain killers in existance. Continual use of narcotic drugs, even under medical supervision, inevitably leads to physical and psychological dependence. The more commonly known drugs within this group are opium, morphine, heroin, codeine, and methadone (a synthetic narcotic). In addition, Darvon and Talwin are included in this group because of their narcotic like action. Heroin is the most popular narcotic drug abused because of its intense euphoria and long-lasting effect. It is far more potent than morphine but has no legitimate use in the United States. Heroin appears as a white, gray, or tan, fluffy powder. The most common method of using heroin is by injection directly into the vein, although it can also be sniffed. Codeine, although milder than heroin and morphine, is sometimes abused as an ingredient in cough syrup preparations. Symptoms of narcotic drug abuse include slow shallow breathing, possible unconsciousness, constriction (narrowing) of the pupils of the eyes to pinpoint size, drowsiness, confusion, and slurred speech.

The narcotic drug abuser, suddenly withdrawn from drugs, may appear as a wildly disturbed person who is agitated, restless, and possibly hallucinating.

Alcohol Intoxication

Alcohol is the most widely abused drug today. Alcohol intoxication is so common that it often fails to receive the attention and respect it deserves. Although there are many alcohols, the type consumed by people is known as ethyl alcohol (ethanol). It is the major chemical ingredient in wines, beers, and distilled liquors. Ethanol is colorless, flammable, intoxicating liquid, classed as a drug because it depresses the central nervous system, affecting physical and mental activities.

Alcohol affects the body of the abuser in stages. Initially there is a feeling of relaxation and well-being, which is followed by gradual disruption of coordination, resulting in inability to accurately and efficiently perform normal activities and skills. Continued alcohol consumption depresses body functions sufficiently to impair breathing and to cause loss of consciousness, coma, and even death.

The physical and psychological addiction potential is very high when alcohol is abused. Withdrawal from alcohol by the abuser can result in delirium tremens (DTs) characterized by anxiety, confusion, restless sleep, sweating, profound depression, hallucinations, and seizures.

Whether in or out of the health care facility, the severely intoxicated individual must be attentively monitored by the health care worker. Obviously, prevention of aspiration, when possible, is the first order of business. In alcohol intoxication, emergency care is indicated following an episode of aspirating vomitus. If aspiration has occurred, airway management and maintenance of cardiopulmonary functions are critical emergency care measures.

Barbiturate Intoxication

The legitimate use of the barbiturates is primarily to induce sleep and relieve tension. They are depressants (downers), and statistically they are the most lethal of the abused drugs because of the depth of coma that can result from respiratory depression and circulatory collapse. The commonly known drugs within this group include phenobarbital, amobarbital, pentobarbital, and secobarbital. They may appear in the form of capsules, tablets, and liquids. Overdose potential is extremely high,and can occur accidentally, especially if the barbiturate is taken in conjunction with alcohol, which tends to multiply the effects of depressant drugs. The physical symptoms of barbiturate abuse include slurred speech, faulty judgement, poor memory, staggering, tremors, rapid movement of the eyeballs with the pupils appearing normal, rapid, shallow breathing, and possibly shock and coma.

Nonbarbiturate Tranquilizer Intoxication

This group of drugs exhibits the same depressant (downer) action as do the barbiturates. The more commonly known drugs within this group include Librium, Valium, Doriden, Miltown, Equanil, and Quaalude. Although there is a possibility of overdose and physical addiction, it is not nearly as great as with the barbiturate drugs and requires larger doses taken over a longer period of time. These drugs are widely used in clinical practice because they are considered to have a wide margin of safety.

Stimulant Intoxication

The stimulants (uppers) directly affect the central nervous system by increasing mental alertness and combating drowsiness and fatigue. One group of stimulants, called amphetamines, is legitimately used in the treatment of conditions such as mild depression, obesity, and narcolepsy (sleeping sickness).

The amphetamines, known as "speed" by the abuser, are the most commonly abuse stimulants and include such drugs as Benzedrine, Dexedrine, Dexamyl, Dosoxyn, Methedrine, and Syndrox. Stimulants may be abused by taking them orally as capsules or tablets, "snorting" through the nose, or injecting into the veins for an immediate and more intense effect.

Physical symptoms of amphetamine abuse include hyperactivity, increased respiration, dilated pupils, increased alertness, sweating, elevated temperature, depressed appetite, and convulsions.

The "comedown" from amphetamine abuse is so unpleasant that the temptation to take repeated doses is overwhelming and sometimes results in the abuser going on "speed runs", which can last up to a week. Then the abuser may sleep several days before awaking depressed, lethargic, and extremely hungry.

Large quantities of amphetamines are physically addicting, and even small amounts can result in psychological dependence. Tolerance to high doses develops, and withdrawal symptoms occur. During the depression state associated with withdrawal, suicide attempts are not uncommon.

Cocaine, although classified as a narcotic, acts as a stimulant and is commonly abused. It is ineffective when taken orally, therefore the abuser either injects it into the vein or "snorts" it through the nose. Its effect is much shorter than that of amphetamines, and occasionally the abuser may inject or snort cocaine every few minutes in an attempt to maintain a constant stimulation and prevent depression experienced during withdrawal ("comedown"). Overdose is possible and can cause death.

The physical symptoms observed in the cocaine abuser will be the same as those observed in the amphetamine abuser.

Hallucinogen Intoxication

The group of drugs that affect the central nervous system by altering the user's perception of self and environment are commonly known as hallucinogens. Included within this group are lysergic acid diethylamide (LSD), mescaline, methylphenethylamine (STP), and psilocybin and phencyclidine (PCP). They appear in several forms: crystals, powders, and liquids.

The symptoms of hallucinogenic drug abuse include dilated pupils, flushed face, increased heartbeat, and a chilled feeling. In addition, the person may display a distorted sense of time and self, show emotions ranging from ecstasy to horror, and experience changes in vision depth perception.

Although no known deaths have resulted from the drugs directly, hallucinogen-intoxicated persons have been known to jump from windows, walk in front of automobiles, or injure themselves in other ways because of the vivid but unreal perception of their environment.

Even though no longer under the direct influence of a hallucinogenic drug, a person who has formerly used one of the drugs may experience a spontaneous recurrence (flashback) of some aspect of the drug experience. The most common type of flashback is the recurrence of perceptual distortion, but disturbing emotion or panic have also recurred. Flashback may be experienced by heavy or occasional users of the hallucinogenic drugs, and its frequency is unpredictable and its cause unknown.

Cannabis Intoxication

Cannabis sativa, commonly known as marijuana, is widely abused and can best be classified as a mild hallucinogen.

The most common physical appearance of marijuana is as ground dried leaves, and the most common method of consumption is by smoking. After a single inhaled dose of marijuana, measurable physical effects reach a maximum within one-half hour and disappear in 3 to 5 hours.

The physical symptoms of Cannabis (marijuana) abuse include dryness of the mouth, irritation of the throat, bloodshot eyes, increased appetite, dizziness or sleepiness, and in heavy smokers, a cough.

Adverse reactions to the drug include anxiety, fear, crying, depression, suspicion, delusions, and, in rare cases, hallucinations.

Although marijuana can produce psychological dependence, there is no evidence of physical dependence; therefore, there are usually no withdrawal symptoms following its discontinuance.

Handling Drug-Intoxicated Persons

As in any emergency medical situation, priorities of care must be established. Conditions involving respiratory or cardiac failure must receive immediate attention before specific action is directed to the drug abuse symptom.

Priorities of Care

- Check for adequacy of airway, breathing, and circulation, and for shock. Give appropriate treatment.

- Keep victim awake.

  —If the victim is sleepy or poorly responding to pain, stimulate by use of cold wet towels, gentle shaking, conversation, and moving about.

  —If victim cannot be aroused, place on his or her side so secretions and vomitus will drain from mouth and not be sucked into the lungs.

- Induce vomiting

  —If victim was seen swallowing drug within past 30 minutes.

WARNING: Do not cause unconscious or semiconscious victims to vomit.

- Prevent victim from self-injury while highly excited or lacking coordination.

  —Use physical restraints only if absolutely necessary.

- Calm and reassure excited victim by "talking him or her down" in a quiet, relaxed, and sympathetic manner.

- Gather materials and information to assist in identifying and treating the suspected drug problem. Spoons, paper packs, eye droppers, hypodermic needles, vials, or collapsible tubes are excellent identification clues.

  —The presence of capsules, pills, drug containers, or needle marks ("tracks") on the victim's body are also significant.

  —A personal history of drug use from the victim or those accompanying the victim is very important and may reveal how long the victim has been abusing drugs, approximate amounts taken, and time between doses. Also, knowledge of past medical problems, including history of convulsions (with or without drugs), is important.

- Transport victim and materials collected to medical facility.

- Brief medical facility personnel and present materials collected at the scene upon arrival at the medical facility.

ENVIRONMENTAL INJURIES

Under the broad category of environmental injuries we will consider a number of first aid problems. Exposure to extremes of temperature, whether heat or cold, causes injury to the skin, tissues, blood vessels, vital organs, and in some cases, the whole body. In addition, contact with the sun's rays, electrical current, or certain chemicals cause injuries similar in character to burns.

THERMAL BURNS

True burns are generated by exposure to extreme heat that overwhelms the body's defensive mechanisms. Burns and scalds are essentially the same injury, burns being caused by dry heat, and scalds by moist heat. The seriousness of the injury can be estimated by the depth, extent, and location of the burn, the age and health of the victim, and other medical complications.

Burns can be classified according to the depth as first, second, and third-degree burns. Figure 4-72 shows the limited damage done to the skin by a first-degree burn. The epidermal layer is irritated, reddened, and tingling. The skin is sensitive to touch and blanches with pressure. Pain is mild to severe. Edema is minimal. Healing usually occurs naturally within a week.

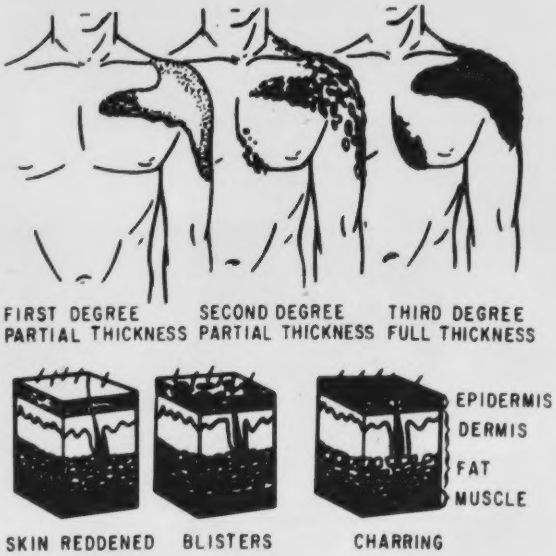

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Figure 4-72.—Classification of burns.

A second-degree burn is characterized by epidermal blisters, mottled appearance, and red base. Damage extends into, but not through, the dermis. Recovery usually takes 2-3 weeks, with some scarring and depigmentation. This condition is painful. Body fluids may be drawn into the injured tissue, causing edema and possibly a "weeping" fluid (plasma) loss at the surface.

Third-degree burns are full-thickness injuries penetrating into muscle and fatty connective tissue or even down to bone. Tissues and nerves are destroyed. Shock with blood in the urine is likely to be present. Pain will be absent at the burn site if all the area nerve endings are destroyed; however, surrounding tissue, which is less damaged, will be painful. Tissue color will range from white (scalds) to black (charring burns). Although the wound is usually dry, body fluids will collect in underlying tissue, and if the area has not been completely cauterized, significant amounts of fluids will be lost by plasma "weeping" or hemorrhage, thus reducing circulation volume. There is considerable scarring and possibly loss of function. Skin grafts may be necessary.

Of greater importance than the depth of the burn in evaluating the seriousness of the condition is the extent of the burned area. A first-degree burn over 50% of the body surface area (BSA) may be more serious than a third-degree burn over 3%. The "rule of nines" is used to give a rough estimate of the surface area affected. Figure 4-73 shows how the rule is applied to adults.

A third factor in burn evaluation is the location of the burn. Serious burns of the head, hands, feet, or genitals will require hospitalization.

The fourth factor is the age and health of the victim. Healthy young adults tolerate burns far better than people over 50 or the very young.

The fifth factor is the presence of any other complications, especially respiratory tract injuries or other major injuries or factors.

The corpsman must take all these factors into consideration when evaluating the condition of the burn victim, especially in a triage situation.

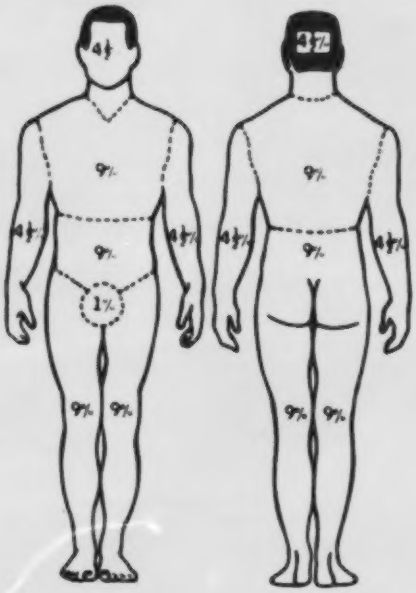

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Figure 4-73.—Rule of nines.

First Aid

After the victim has been removed from the source of the thermal injury, first aid should be kept to a minimum:

- Maintain an open airway.
- Control hemorrhage, and treat for shock.
- Remove constricting jewelry and articles of clothing.
- Protect the burn area from contamination by covering it with clean sheets or dry dressings. DO NOT remove clothing adhering to a wound.
- Splint fractures.
- For all serious and extensive burns (over 20% BSA), and in the presence of shock, start IV therapy with an electrolyte solution (Ringer's lactate) in an unburned area.
- Maintain the IV treatment during transportation.

- Relieve mild pain with aspirin. Relieve moderate pain with cool wet compresses or icewater immersion (for burns of less than 20% BSA). Severe pain may be relieved with morphine or demerol injections, given intravenously during the edema period, if ordered by a physician. Pain resulting from small burns may be relieved with an anesthetic ointment providing the skin is not broken.

Aid Station Care

- Continue to observe for airway patency, hemorrhage, and shock.

- Continue IV in place or start a new one under a medical officer's supervision to control shock and replace fluid loss.

- Monitor urine output.

- Shave body hair well back from the burned area and then cleanse the area gently with disinfectant soap and warm water. Remove dirt, grease, and nonviable tissue. Apply a sterile bandage of dry gauze. Place bulky dressings beneath the burned parts to absorb serous exudate.

- All major burn victims should be given a booster dose of tetanus toxoid to guard against infection. Administration of pencillin may be directed by a medical officer.

- If evacuation to a definitive care facility will be delayed for 2 to 3 days, start topical chemotherapy after the patient stabilizes and following debridement and wound care. Gently spread a 1/8-inch thickness of Sulfamylon over the burned area. Repeat application after 12 hours, then daily. Treat minor skin reactions with antihistamines.

SUNBURN

Sunburn results from prolonged exposure to the ultraviolet rays of the sun. First and second-degree burns similar to thermal burns result. Treatment is essentially the same as that outlined for thermal burns. Unless a major percentage of the body surface is affected, the victim will not require more than first aid attention. Commercially prepared sunburn lotions and ointments may be used. Prevention through education and the proper use of sun screens is the best way to avoid this condition.

ELECTRICAL BURNS

Electrical burns may be far more serious than a preliminary examination may indicate. The entrance and exit wound may be small, but as electricity penetrates the skin it burns a large area below the surface, as indicated in figure 4-74. An HM can do little for these victims besides monitoring the basic life functions, delivering CPR, treating for shock if necessary, covering the entrance and exit wounds with a dry sterile dressing, and transporting the victim to a medical facility.

Before treatment is started, ensure that the victim is no longer in contact with a live electrical source. Shut the power off or use a nonconducting rope or stick to move the victim away from the line or the line away from the victim (fig. 4-75).

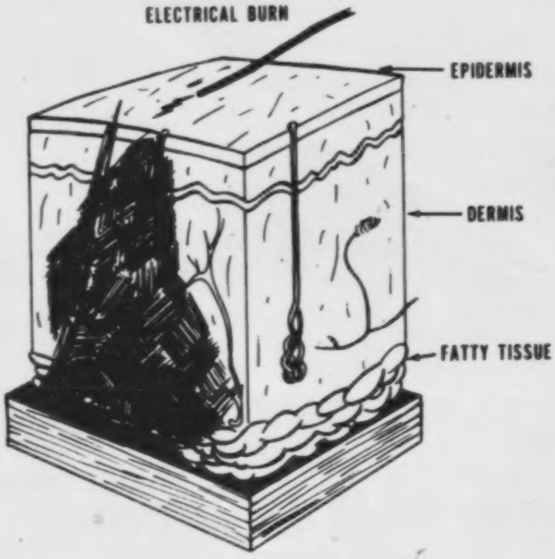

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Figure 4-74.—Electrical burns.

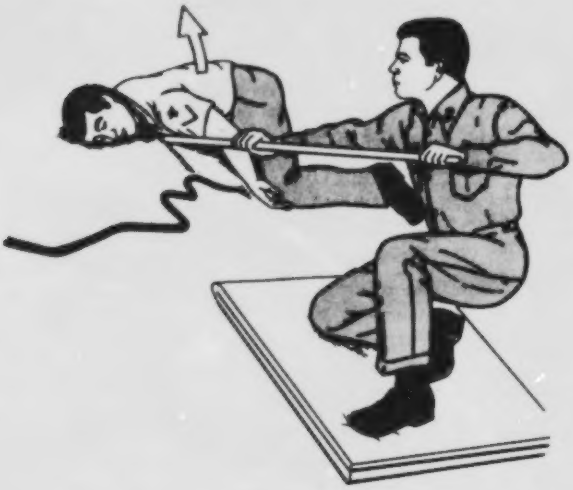

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Figure 4-75.—Moving a victim away from an electrical line.

CHEMICAL BURNS

When acids, alkalies, or other chemicals come in contact with the skin or other body membranes, they may cause injuries that are generally referred to as chemical burns. For the most part these injuries are not caused by heat but by direct chemical destruction of body tissues. Areas most often affected are the extremities, mouth, and eyes. Alkali burns are usually more serious than acid burns, because alkalies penetrate deeper and burn longer.

When such burns occur the following emergency procedures must be carried out immediately:

1. Quickly flush the area with large amounts of water, using a shower or hose if available. Do not apply water too forcefully. Continue to flood the area while the clothing, including shoes and socks, is being removed, as well as afterwards. NOTE: There are two exceptions to the above. In alkali burns caused by dry lime, the mixing of water and lime creates a very corrosive substance. Dry lime should be brushed away from skin and clothing, unless large amounts of water are available for rapid and complete flushing. In acid burns caused by phenol (carbolic acid), wash the affected area with alcohol because phenol is not water-soluble; then wash with water. If alcohol is not available, flushing with water is better than no treatment at all.
2. After thorough washing, neutralize any chemical remaining on the affected area. WARNING: do not attempt to neutralize a chemical unless you know exactly what it is and what substance will neutralize it. Further damage may be done by a neutralizing agent that is too strong or incorrect. For acid burns make a solution of one teaspoon of baking soda in a pint of water and flush it over the affected area. For alkali burns mix one or two teaspoons of vinegar in a pint of water and flush it over the affected area.
3. Flush the area again with water and gently pat dry with sterile gauze. Do not rub.
4. Transport the victim to a medical facility.

Chemical Burns of the Eye

Flush the eye immediately with large amounts of fresh clean water. Acid burns of the eyes should be flushed for 15-30 minutes. This treatment should be repeated every half hour for several hours. Alkali burns of the eyes should be flushed with large amounts of fresh water as for acid burns, then they should be irrigated for 30-45 minutes with a weak acetic acid/water solution. Mix one or two teaspoons of vinegar in a pint of water. Because of the intense pain, the victim may be unable to open the eyes. If this occurs, hold the eyelids apart so that water can flow across the eye.

A drinking fountain or field "water buffalo" may be used to supply a steady stream of water. Hold the victim's head in a position that allows water to flow from the inside corner of the eye toward the outside. Do not allow the water to fall directly on the eye, nor use greater force than is necessary to keep the water flowing across the eye.

CAUTION: Never use any chemical antidotes such as baking soda or alcohol in treating burns of the eye.

After thorough irrigation loosely cover both eyes with a clean dressing. This prevents further damage by decreasing eye movement.

The aftercare for all chemical burns is similar to that for thermal burns: cover the affected area and get the victim to a medical facility as soon as possible.

WHITE PHOSPHORUS BURNS

A special category of burns that may affect military personnel in a wartime or training situation is that caused by exposure of white phosphorus (WP or "Willy Peter"). First aid for this type of burn is complicated by the fact that white phosphorus particles ignite upon contact with air.

Superficial burns caused by simple skin contact or burning clothes should be flushed with water and treated like thermal burns. Partially embedded white phosphorus particles must be continuously flushed with water while the first-aider removes them with whatever tools are available (tweezers, pliers, etc). Do this quickly but gently. Firmly or deeply embedded particles that cannot be removed by the first-aider must be covered with a saline-soaked dressing, which must be kept wet until the victim reaches a medical facility. The wounds containing embedded phosphorus particles may then be rinsed with a dilute (1%) freshly mixed solution of copper sulfate. This solution combines with phosphorus on the surface of the particles to form a blue-black cupric phosphide covering, which both impedes further oxidation and facilitates identification of retained particles. Under no circumstances should copper sulfate solution be applied as a wet dressing, and wounds must be flushed thoroughly with saline solution following the copper sulfate rinse to prevent absorption of excessive amounts of copper, since copper has been associated with extensive intravascular hemolysis. An adjunt to the management of phosphorus burn injuries is the identification of the retained phosphorescent particles in a darkened room during debridement.

NOTE: Combustion of white phosphorus results in the formation of a severe pulmonary irritant. The ignition of phosphorus in a closed space such as the BAS tent or sickbay may result in the development of irritant concentrations sufficient to cause acute inflammatory changes in the tracheobronchial tree. The effects of this gas, especially during debridement, can be minimized by placing a moist cloth over the nose and mouth to inactivate the gas and ventilating the tent.

HEAT EXPOSURE INJURY

Excessive heat affects the body in a variety of ways. When a person exercises or works in a hot environment, heat builds up inside the body. The body automatically reacts to get rid of this heat through the sweating mechanism. This depletes water and electrolytes from the circulating volume. If they are not adequately replaced, body functions are affected, and initially, heat cramps and heat exhaustion develop. If the body becomes too overheated, or water or electrolytes depleted, the sweat control mechanism of the body malfunctions and shuts down. The result is heat stroke (sunstroke). Heat exposure injuries are a threat in any hot environment, but especially in desert or tropical areas and in the boiler rooms of ships. Under normal conditions it is a preventable injury. Individual and command awareness of the causes of heat stress problems, as well as compliance with current heat exposure management instructions, should eliminate heat exposure injuries.

Heat Cramps

Excessive sweating may result in painful heat cramps in the muscles of the abdomen, legs, and arms. Heat cramps may also result from drinking ice water or other cold drinks either too quickly or in too large a quantity after exercise. Muscle cramps are often an early sign of approaching heat exhaustion.

Treatment

To provide first-aid treatment for heat cramps, move the patient to a cool place. Since heat cramps are caused by loss of salt and water, give the victim plenty of cool (not cold) water to drink, adding about 1 teaspoon of salt to a liter or quart of water. Apply manual pressure to the cramped muscle, or gently massage it to relieve the spasm. If there are indications of anything more serious, transport the victim immediately to a medical facility.

Heat Exhaustion

Heat exhaustion (heat prostration or heat collapse) is the most common condition caused by working or exercising in hot environments. In heat exhaustion there is a serious disturbance of blood flow to the brain, heart, and lungs. This causes the victim to experience weakness, dizziness, headache, loss of appetite, and nausea. The victim may faint, but will probably regain consciousness as the head is lowered, which improves the blood supply to the brain. Signs and symptoms of heat exhausion are similar to those of shock; the victim will appear ashen gray, the skin cold, moist, clammy, and the pupils may be dilated (fig. 4-76). The vital signs usually are normal; however, the victim may have a weak pulse together with rapid and shallow breathing. Body temperature may be below normal.

Treatment

Treat as if the victim were in shock. Move the victim to a cool or air-conditioned area. Loosen the clothing, apply cool wet cloths to the head, axilla, groin, and ankles, and fan the victim. Do not allow the victim to become chilled (if this does occur, then cover with a light blanket and move into a warmer area). If the victim is conscious, give a solution of 1 teaspoon of salt dissolved in a liter of cool water. If the victim vomits, do not give any more fluids. Transport to a medical facility as soon as possible. Intravenous fluid infusion may be necessary for effective fluid and electrolyte replacement to combat shock.

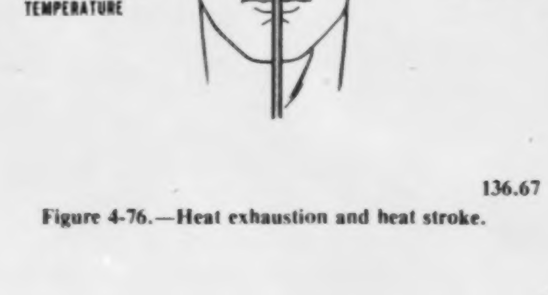

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Figure 4-76.—Heat exhaustion and heat stroke.

Heat Stroke

Sunstroke is more accurately called heat stroke since it is not necessary to be exposed to the sun for this condition to develop. It is a less common but far more serious condition than heat exhaustion, since it carries a 20% mortality rate. The most important feature of heat stroke is the extremely high body temperature (105 °F, 41 °C, or higher) accompanying it. In heat stroke the victim suffers a breakdown of the sweating mechanism and is unable to eliminate excessive body heat built up while exercising. If the body temperature rises too high, the brain, kidneys, and liver may be permanently damaged.

Sometimes the victim may have preliminary symptoms such as headache, nausea, dizziness, or weakness. Breathing will be deep and rapid at first, later shallow and almost absent. Usually the victim will be flushed, very dry, and very hot. The pupils will be constricted (pinpoint) and the pulse fast and strong. See figure 4-76. Compare these symptoms with those of heat exhaustion.

Treatment

When providing first aid for heat stroke, remember that this is a true life-and-death emergency. The longer the victim remains overheated, the more likely irreversible brain damage or death is to occur. First aid is designed to reduce body heat fast.

Reduce heat immediately by dousing the body with cold water or by applying wet, cold towels to the whole body. Move the victim to the coolest possible place and remove as much clothing as possible. Maintain an open airway. Place the victim on his or her back, with the head and shoulders slightly raised. If cold packs are available, place them under the arms, around the neck, at the ankles, and in the groin. Expose the victim to a fan or air conditioner, since drafts will promote cooling. Immersing the victim in a cold water bath is also effective. If the victim is conscious, give cool water to drink. Do not give any hot drinks or stimulants. Discontinue cooling when the rectal temperature reaches 102°F; watch for recurrence of temperature rise by checking every 10 minutes. Repeat cooling if temperature reaches 103°F rectally.

Get the victim to a medical facility as soon as possible. Cooling measures must be continued while the victim is being transported. Intravenous fluid infusion may be necessary for effective fluid and electrolyte replacement to combat shock.

Prevention of Heat Exposure Injuries

The prevention of heat exposure injuries is a command responsibility, but the medical department plays a role in it by educating "all hands" about the medical dangers, monitoring environmental health, and advising the Commanding Officer.

On the individual level, prevention centers on water and salt replacement. Sweat must be replaced ounce for ounce, thus, in a hot environment, water consumption must be drastically increased. Salt should be replaced by way of well-balanced meals, three times a day, salted to taste. In the field, "C" rations contain enough salt to sustain a person in most situations. DO NOT use salt tablets unless specified by a doctor. DO NOT use alcoholic beverages.

At the command level, prevention centers on an awareness of the environment. The Wet Bulb Globe Temperature (WBGT) indicator must be monitored regularly and the results interfaced with the Physiological Heat Exposure Limits (PHEL) chart and the work/rest chart before work assignments are made. In addition, unnecessary heat sources, especially steam leaks, must be eliminated, and vents and exhaust blowers must be checked for adequate circulation. The results will be a happier, healthier, and more productive crew.

COLD EXPOSURE INJURY

When the body is subjected to extremely cold temperatures, blood vessels constrict, and body heat is gradually lost. As the body temperature drops, tissues are easily damaged or destroyed.

The cold injuries resulting from inadequate response to the cold in military situations have spelled disaster for many armies; for example, those of Napoleon and Hitler in their Russian campaigns. The weather (temperature, humidity, precipitation, and wind) is the predominant influence in the development of cold injuries. Falling temperature interacting with high humidity, a wet environment, and rising wind accelerate the loss of body heat. The other major causative factor is the type of mission. For example, riflemen involved in static defense or pinned down by enemy fire suffer from greater exposure to the elements and lack the opportunity to properly warm their bodies, change clothes, keep clean, or eat balanced meals. They may also suffer from fatigue and fear, which contribute to apathy and neglect. Other factors that influence the development of cold injuries are dehydration, the presence of other injuries (especially those causing a reduction in circulatory flow), and a previous cold injury (which increases susceptibility by lowering resistance). In addition, the use of any drug, including alcohol, that modifies autonomic nervous system response or alters judgement ability can drastically reduce an individual's chance for survival.

Like heat exposure injuries, cold injuries are preventable. Acclimatization, the availability of warm, layered clothing, and maintenance of good discipline and training standards are important factors. These are a command, not a medical, responsibility, but the HM will have a crucial role as a monitor of nutritional intake and personal hygiene (with emphasis on foot care) and as an advisor to the Commanding Officer. The HM will also be responsible for acquainting the troops with the dangers of cold exposure and with prevention measures.

Two major points must be stressed in the management of all cold injuries: rapid rewarming is of primary importance, and all unnecessary manipulations of affected areas must be avoided. More will be said about these points later. In military operations the treatment of cold injuries is influenced by (1) the tactical situation, (2) the facilities available for the evacuation of casualties, and (3) the fact that most cold injuries are encountered in large numbers during periods of intense combat when many other wounded casualties appear. Highly individualized treatment under these circumstances may be impossible, because examination and treatment of more life-endangering wounds must be given priority. In a high casualty situation, shelter cold injury victims and try to protect them from further injury until there is sufficient time to treat them.

All cold injuries are similar, varying only in the degree of tissue damage. In general, the effects of cold are broken down into two types: general cooling of the entire body and local cooling of parts of the body; however, cold injuries will seldom be totally of one type.

General Cooling (Hypothermia)

General cooling of the whole body is caused by continued exposure to low or rapidly falling temperatures, cold moisture, snow, or ice. Those exposed to low temperature for extended periods may suffer ill effects, even if they are well protected by clothing, because cold affects the body systems slowly, almost without notice. As the body cools, there are several stages of progressive discomfort and disability. The first symptom is shivering, which is an attempt to generate heat by repeated contractions of surface muscles. This is followed by a feeling of listlessness, indifference, and drowsiness. Unconsciousness can follow quickly. Shock becomes evident as the victim's eyes assume a glassy stare, respiration becomes slow and shallow, and the pulse weak or absent. As body temperature drops even lower, peripheral circulation decreases, and the extremities become susceptible to freezing. Finally, death results as the core temperature of the body approaches 80°F.

Treatment

1. Carefully observe respiratory effort and heart beat since CPR may be required while the warming process is underway.

2. Rewarm the victim as soon as possible. It may be necessary to treat other injuries before the victim can be moved to a warmer place. Severe bleeding must be controlled and fractures splinted over clothing before the victim is moved.

3. Replace wet or frozen clothing and remove anything that constricts the victim's arms, legs, or fingers, interfering with the circulation.

4. If the victim is inside a warm place and is conscious, the most effective method of warming is immersion in a tub of warm (100-105°F or 38-41°C) water. The water should be warm to the elbow—never hot. Observe closely for signs of respiratory failure and cardiac arrest (rewarming shock).

5. If a tub is not available, apply external heat to both sides of the victim. Natural body heat (skin to skin) from two rescuers is the best method. This is called "buddy warming." If this is not practical, use hot water bottles or an electric rewarming blanket, but do not place them next to bare skin, and be careful to monitor the temperature of the artifical heat source, since the victim is very susceptible to burn injury. Because the victim is unable to generate adequate body heat, placement under a blanket or in a sleeping bag is not sufficient treatment.

6. If the victim is conscious, give warm liquids to drink. Never give alcoholic beverages or allow the victim to smoke.

7. Dry the victim thoroughly if water is used for rewarming.

8. As soon as possible, transfer the victim to a definitive care facility. Be alert for the signs of respiratory and cardiac arrest during transfer, and keep the victim warm.

Local Cooling

Local cooling injuries, affecting parts of the body, fall into two categories: freezing and nonfreezing injuries. In order of increasing seriousness they include chilblain, immersion foot, superficial frostbite, and deep frostbite. The areas most commonly affected are the face and extremities.

Chilblains

Chilblains are a mild cold injury caused by prolonged and repeated exposure for several hours to air temperatures from above freezing (32°F/0°C) to as high as 60°F (16°). Chilblains are characterized by redness, swelling, tingling, and pain of the skin area. Injuries of this nature require no specific treatment except warming of the affected part, (if possible use a water bath of 98°-105°F), keeping it dry, and preventing further exposure.

Immersion Foot

Immersion foot, which also may occur in the hands, results from prolonged exposure to wet cold at temperatures ranging from just above freezing (32°F/0°C) to 50°F (10°C) and usually in connection with limited motion of the extremities and water-soaked protective clothing.

Sings and symptoms of immersion foot are tingling and numbness of the affected areas; swelling of the legs, feet, or hands; bluish discoloration of the skin; and painful blisters. Gangrene may occur.

Treatment

1. Get the victim off his or her feet as soon as possible.
2. Remove wet shoes, socks, and gloves to improve circulation.
3. Expose the affected area to warm dry air.
4. Keep the victim warm.
5. Do not rupture blisters or apply salves and ointments.
6. If the skin is not broken or loose, the injured part may be left exposed; however, if it is necessary to transport the victim, the injured area should be covered with loosely wrapped fluff bandages of sterile gauze.
7. If the skin is broken, place a sterile sheet under the extremity and gently wrap it to protect the sensitive tissue from pressure and additional injury.
8. Transport the victim as soon as possible to a medical facility as a litter patient.

Frostbite

Frostbite occurs when ice crystals form in the skin or deeper tissues after exposure to a temperature of 32°F (0°C) or lower. Depending upon the temperature, altitude, and wind speed, the exposure time necessary to produce frostbite varies from a few minutes to several hours. The areas commonly affected are the face and extremities.

The symptoms of frostbite are progressive. Victims generally incur this injury without being acutely aware of it. Initially, the affected skin reddens and there is an uncomfortable coldness. With continued heat loss, there is a numbness of the affected area due to reduced circulation. As ice crystals form, the frozen extremity appears white, yellow-white, or mottled blue-white, and is cold, hard, and insensitive to touch or pressure.

Frostbite is classified as superficial or deep, depending on the extent of tissue involvement.

Superficial Frostbite

In superficial frostbite the surface of the skin will feel hard, but the underlying tissue will be soft, allowing it to move over bony ridges. This is evidence that only the skin and the region just below it are involved.

Treatment

1. Take the victim indoors.
2. Rewarm hands by placing them under the armpit, against the abdomen, or between the legs.
3. Rewarm feet by placing them in the armpit or against the abdomen of the buddy.
4. Gradually rewarm the affected area by warm water immersion, skin to skin contact, or hot water bottles.
5. Never rub a frostbite area.

Deep Frostbite

In deep frostbite the freezing reaches into the deep tissue layers. There are ice crystals in the entire thickness of the extremity. The skin will not move over bony ridges and feels hard and solid.

The objectives of treatment are to protect the frozen areas from further injury, to rapidly thaw the affected area, and to be prepared to respond to circulatory or respiratory difficulties.

1. Carefully assess and treat any other injuries first. Constantly monitor the victim's pulse and breathing since respiratory and heart problems can develop rapidly. Be sure to administer CPR if necessary.
2. Make no attempt to thaw the frostbitten area if there is a possibility of refreezing. It is better to leave the part frozen until the victim arrives at a medical facility equipped for long term care. Refreezing of a thawed extremity causes severe and disabling damage.
3. Treat all victims with injuries to feet or legs as litter patients. When this is not possible the victim may walk on the frozen limb, since it has been proven that walking will not lessen the chances of successful treatment as long as the limb has not thawed out.
4. When adequate protection from further cold exposure is available, prepare the victim for rewarming by removing all constricting clothing such as gloves, boots, and socks. Boots and clothing frozen on the body should be thawed by warm water immersion before removal.
5. Rapidly rewarm frozen areas by immersion in water at 100°-105°F (38-41°C). Keep the water warm by adding fresh hot water, but do not pour it directly on the injured area. Ensure that the frozen area is completely surrounded by water; do not let it rest on the side or bottom of the tub.
6. After rewarming has been completed, pat the area dry with a soft towel. At first the injured area will feel numb and look mottled blue or purple. Later it will swell, sting, and burn. Blisters may develop. These should be protected from breaking. Avoid pressure, rubbing, or constriction of the injured area. Keep the skin dry with sterile dressings and place cotton between the toes and fingers to prevent their sticking together.
7. Protect the tissue from additional injury and keep it as clean as possible (sterile dressings and linen should be used).
8. Try to improve the general morale and comfort of the victim by giving hot, stimulating fluids such as tea or coffee. Do not allow the victim to smoke or use alcoholic beverages while being treated.
9. Transfer to a medical facility as soon as possible. During transportation slightly elevate the frostbitten area and keep the victim and the injured area warm. Do not allow the injured area to be exposed to the cold.

Later Management of Cold Injury

When the patient reaches a hospital or a facility for definitive care, the following treatment should be employed:

1. Maintain continued vigilance to avoid further damage to the injured tissue. In general,

this is accomplished by keeping the patient at bed rest with the injured part elevated, on surgically clean sheets, and with sterile pieces of cotton separating the toes. All lesions should be exposed to the air at normal room temperature. Weight bearing on injured tissue must be avoided.

2. Whirlpool baths, twice daily, at 98.6°F (37°C), with surgical soap added, assist in superficial debridement, reduce superficial bacterial contamination, and make range of motion exercises more tolerable.

3. Analgesics may be required in the early post-thaw days but will soon become unnecessary in uncomplicated cases.

4. The patient should be encouraged to take a nutritious diet with adequate fluid intake to maintain hydration.

5. Superficial debridement of ruptured blebs should be performed, and suppurative scabs and partially detached nails should be removed.

COMMON MEDICAL EMERGENCIES

This section of the chapter deals with some other relatively common medical problems a corpsman may face in a first-aid situation. Generally speaking, these particular problems are the result of previously diagnosed medical conditions, so at least for the victim they do not come as a complete suprise. Many of these victims will be wearing a MEDIC ALERT necklace or bracelet, or carrying a MEDIC ALERT identification card which specifies the nature of the medical condition or the type of medications being taken. In all cases of sudden illness, search the victim for a MEDIC ALERT symbol. It may help you diagnose the victim's problem and start appropriate first-aid procedures immediately.

After checking the vital signs, you must carefully assess all the signs and symptoms before making a preliminary diagnosis.

- Determine the victim's level of consciousness, including orientation to surroundings and reaction to pain stimulus.

- Check the limbs for weakness or paralysis.

- Check pupil size and reaction to light for signs of brain injury.

- Continuously monitor respiration depth and rate.

- Log all observations carefully for evaluation by a physician.

FAINTING (SYNCOPE)

Uncomplicated fainting is the result of blood pooling in dilated veins, which reduces the amount of blood being pumped to the brain. Causes include getting up too quickly, standing for long periods with little movement, and stressful situations. Signs and symptoms that may be present are dizziness, nausea, visual disturbance from pupillary dilation, sweating, pallor, and a weak rapid pulse. As the body collapses, blood returns to the head and consciousness is quickly regained. Revival can be promoted by carefully placing the victim in the shock position or the sitting position with the head between the knees. Placing a cool wet cloth on the face and loosening the clothing can also help.

Syncope may also result from an underlying medical problem such as diabetes, cerebrovascular accident (stroke), heart conditions, and epilepsy.

DIABETIC CONDITIONS

Diabetes mellitus is an inherited condition in which the pancreas secretes an insufficient amount of the protein hormone insulin. Insulin regulates carbohydrate metabolism by enabling glucose to enter cells for use as an energy source. Diabetics almost always wear a MEDIC ALERT identification symbol.

Diabetic Coma

Diabetics suffer from rising levels of glucose in the blood stream (hyperglycemia). This in turn triggers the kidneys to produce large amounts of urine in an attempt to purge the body of this excess glucose. A serious dehydration (hypovolemia) results. Concurrently, lack of glucose in the cells leads to an increase in acids in the blood (acidosis) as other substances, such as fats, are metabolized as energy sources. The result is gradual central nervous system depression, starting with symptoms of confusion and disorientation and leading to stupor and coma. Blood pressure falls as the pulse rate becomes rapid and weak. Respirations are deep, and a sickly sweet acetone odor is present on the breath. The skin is warm and dry. (NOTE: Too often a diabetic victim is treated as a drunk, since the signs and symptoms presented are similar to those of alcohol intoxication.)

The diabetic tries to balance the use of insulin against glucose intake to avoid the above problems. Diabetic coma most often results either from forgetting to take insulin or taking too little insulin to maintain a balanced condition. The victim or the victim's family may be able to answer two key questions:

- Has the victim eaten today?
- Has he or she taken the prescribed insulin?

If the answer is yes to the first and no to the second question, the victim is probably in diabetic coma.

Emergency first aid centers around ABC support, administration of oral or intravenous fluids to counter shock, and rapid evacuation to a medical officer's supervision.

Insulin Shock

Insulin shock results from too little sugar in the blood (hypoglycemia). It develops when a diabetic exercises too much or eats too little after taking insulin. This is a very serious condition, because glucose is driven into the cells to be metabolized, leaving too little in circulation to support the brain. Brain damage develops quickly. Signs and symptoms include:

- pale, moist skin.
- dizziness, headache.
- strong, rapid pulse.
- fainting, seizures, coma.
- normal respiration and blood pressure.

Treatment is centered on getting glucose into the system quickly to prevent brain damage. Placing sugar cubes under the tongue is most beneficial. Transport the victim to a medical center as soon as possible.

NOTE: If you are in doubt as to whether the victim is in insulin shock or diabetic coma, give sugar. Brain damage develops very quickly in insulin shock and must be reversed immediately. If the victim turns out to be in diabetic coma, the extra sugar will do no appreciable harm since this condition progresses slowly.

CEREBROVASCULAR ACCIDENT

A cerebrovascular accident (CVA), also known as a stroke or apoplexy, is caused by an interruption of the arterial blood supply to a portion of the brain. This interruption may be caused by arteriosclerosis or by a clot forming in the brain. Tissue damage and loss of function result.

Onset is sudden, with little or no warning. The first signs include weakness or paralysis on the side of the body opposite the side of the brain which has been injured. Muscles of the face on the injured side may be invovled. The level of consciousness varies from alert to unconscious. Motor functions on the injured side are disturbed, including vision and speech. The throat may be paralyzed.

First aid is mainly supportive. Special attention must be paid to the airway, since the victim may not be able to keep it clear. Place the victim in a semireclining position or on the paralyzed side.

- Be prepared to use suction if the victim vomits.
- Act in a calm, reassuring manner, and keep onlookers quiet since the victim may be able to hear what is going on.

- Be prepared to administer oxygen if the victim appears cyanotic.

- Carefully monitor vital signs and keep a log. Pay special attention to respirations, pulse strength or rate, and the presence or absence of the bilateral carotid pulse.

- Transport the victim to a medical facility as soon as possible.

ANAPHYLACTIC REACTIONS

This condition, also called anaphylaxis or anaphylactic shock, is a severe allergic reaction to foreign material. Penicillin and toxin from bee stings are probably the most common causative agents, although foods, inhalants, and contact substances can also cause a reaction. Anaphylaxis can happen at any time, even to people who have taken penicillin many times before without experiencing any problems. This condition produces severe shock and cardiopulmonary failure. Because of this, immediate intervention is necessary.

The most characteristic and serious symptoms of an anaphylactic reaction are loss of voice and difficulty in breathing. Other typical signs are giant hives, coughing, and wheezing. As the condition progresses, signs and symptoms of shock develop, followed by respiratory failure. Emergency management consists of maintaining vital life functions. The medical officer must be summoned immediately.

HEART CONDITIONS

A number of heart conditions are commonly referred to as heart attacks. These include angina pectoris, acute mycardial infarction, and congestive heart failure. Together they are the cause of at least half a million deaths per year in our country. They occur more commonly in men in the 50-60 year age group. Predisposing factors are lack of physical conditioning, high blood pressure and blood cholesterol levels, smoking, diabetes, and a family history of heart disease.

Angina Pectoris

This condition is caused by insufficient oxygen being circulated to the heart muscle. It results from a partial occlusion of the coronary artery, which allows the heart to function adequately at rest, but does not allow enough oxygen-enriched blood through to support sustained exercise. When the body overexerts itself, the heart muscle becomes starved for oxygen, resulting in a squeezing substernal pain, which may radiate to the left arm and to the jaw.

Angina is differentiated from other forms of heart problems by the fact that the pain results from exertion and subsides with rest. Many people who suffer from angina pectoris carry nitroglycerine tablets. If the victim of a suspected angina attack is carrying a bottle of these pills, place one pill under the tongue. Relief will be almost instantaneous. Other first aid procedures include reassurance, comfort, monitoring vital signs, and transporting to a medical facility.

Acute Myocardial Infarction

This condition results when a coronary artery is severely occluded by arteriosclerosis or completely blocked by a clot. The pain is similar to that of angina pectoris, but it is longer in duration, not related to exertion or relieved by nitroglycerine, and leads to death of heart muscle tissue. Other symptoms are sweating, weakness, and nausea. The pulse rate increases and may be irregular. Blood pressure falls. Respirations are usually normal. The victim may have an overwhelming feeling of doom. Quick or lingering death may result.

First aid for an acute myocardial infarction includes:

- Reassurance and comfort while placing the victim in a semi-sitting position to alleviate fear.

- Loosening all clothing.

- Carefully maintaining a log of vital signs, and recording the history and general observations.

- Continuously monitoring vital signs and being prepared to start CPR.

- Starting a slow IV infusion of dextrose solution.

- Administering oxygen.

- Quickly transporting the victim to a medical facility.

Congestive Heart Failure

A heart suffering from prolonged hypertension, valve disease, or heart disease will try to compensate for the decreased function by increasing the size of the left venticular pumping chamber and increasing the heart rate. As blood pressure increases, fluid is forced out of the blood vessels and into the lungs, causing pulmonary edema. This leads to rapid shallow respirations, the appearance of pink, frothy bubbles at the nose and mouth, and the distinctive "rales" sound in the chest. Increased blood pressure may also cause body fluids to pool in the extremities.

Emergency treatment for conjestive heart failure is essentially the same as that for acute myocardial infarction. Do not start CPR unless heart function ceases. A sitting position promotes blood pooling in the lower extremities.

EPILEPSY

Epilepsy, also known as seizures or fits, is a condition characterized by massive discharge of cranial neurons that sends all or parts of the body into convulsions. It may result from head trauma, scarred brain tissue, brain tumors, cerebral arterial occlusion, fever, or a number of other factors. Fortunately it can often be controlled by medication.

Grand mal seizure is the more serious type of epilepsy. It is preceded by an aura that its victim soon comes to recognize, giving time to lie down and prepare for the onset of the seizure. A burst of nerve impulses from the brain causes unconsciousness and generalized muscular contractions, along with loss of bladder and bowel control. The primary dangers are tongue biting and injuries resulting from falls. A period of sleep or mental confusion follows. When full consciousness returns, the victim will have little or no recollection of the attack.

Petit mal seizure is of short duration and is characterized by only partial loss of consciousness and localized muscular contractions. There is no warning and little or no memory of the attack after it is over.

First-aid treatment consists of protecting the victim from self injury and placing a padded bite stick between the jaws to prevent tongue biting.

DROWNING

Drowning is a suffocating condition in a water environment. Water seldom enters the lungs in appreciable quantities because, upon contact with fluid, laryngeal spasm occurs, which seals the airway from the mouth and nose passages. To avoid serious damage from the resulting hypoxia, quickiy bring the victim to the surface and start artificial ventilation, even before the victim is pulled to shore. Do not interrupt artificial ventilation until rescuer and victim are on dry ground, then quickly administer an abdominal thrust to empty the lungs, and immediately restart the ventilation until spontaneous breathing returns. Oxygen enrichment is desirable if a mask is available.

Remember that an apparently lifeless person who has been immersed in cold water for a long period may be revivied if artificial ventilation is started immediately.

EMERGENCY CHILDBIRTH

Every corpsman must be prepared to handle the unexpected arrival of a new life into the world. If the HM is fortunate, a prepackaged sterile delivery pack will be available. This will contain all the equipment needed to deliver a normal baby. If the pack is not available, imaginative improvisation of clean alternatives will be needed.

When an HM is faced with an imminent childbirth, the first determination to be made is whether there will be time to transport the victim to a hospital. To help make this determination, the corpsman should try to find out whether or not this will be a woman's first delivery (first deliveries usually take much longer than subsequent deliveries); how far apart the contractions are (if less than 3 minutes, delivery is approaching); whether or not a mother senses that she has to move her bowels (if so then the baby's head is well advanced down the birth canal); whether or not there is crowning (bulging) of the vaginal orifice (crowning indicates that the baby is ready to present itself); and how long it will take to get to the hospital. The HM must weigh the answers to these questions to decide if it will be safe to transport the patient to the hospital.

Prior to the childbirth a corpsman must quickly "set the stage" to aid the event. The mother must not be allowed to go to the bathroom since the straining may precipitate the delivery in the worst possible location. Do not try to inhibit the natural process of childbirth by having the mother cross her legs. The mother should by lying back on a sturdy table, bed, or stretcher. A folded sheet or blanket should be placed under her buttocks for absorption and comfort. Remove all clothing below the waist; bend the knees and move the thighs apart; and drape the woman with clean towels or sheets. The HM should then don sterile gloves or, if these are not available, rewash his or her hands.

In a normal delivery your calm professional manner and sincere reassurance to the mother will go a long way towards alleviating her anxiety and making the delivery easier for everyone. Help the woman rest and relax as much as possible between contractions. During contractions deep, open-mouth breathing will relieve some pain and straining. As the child's head reaches the area of the rectum, its pressure will cause the mother to feel an urgent need to defecate. Reassurance that this is a natural feeling and a sign that the baby will soon be born will alleviate her apprehension.

Watch for the presentation of the top of the head. Once it appears, take up your station at the foot of the bed and gently push against the head to keep it from popping out in a rush. Allow it to come out slowly. As more of the head appears, check to be sure that the umbilical cord is not wrapped around the neck. If it is, gently try to untangle it, or move one section over the baby's shoulder. If this is impossible, clamp in two places, 2 inches apart, and cut it. Once the chin emerges use the bulb syringe from the pack to suction the nostrils and mouth, while you support the head with one hand. Compress the bulb prior to placing it in the mouth or nose, otherwise there will be a forceful aspiration into the lungs. The baby will now start a natural rotation to the left or right, away from the face down position. As this is occurring, keep the head in a natural relationship with the back. The shoulders appear next, usually one at a time. From this point on it is essential to remember that the baby is VERY slippery, and great care must be taken so that you do not drop it. The surface beneath the mother should extend at least 2 feet out from the buttocks so that the baby would not be hurt if it did slip out of the HM's hands. Keep one hand beneath the baby's head and use the other to support its emerging body.

Once the baby has been born, suction the nose and mouth again if breathing has not started. Wipe the face, nose, and mouth clean with sterile gauze. Your reward will be the baby's hearty greeting to the world.

Clamp the umbilical cord as the pulsations cease. Use two clamps from the prepackaged sterile delivery pack, 2 inches apart, with the first clamp 6-8 inches from the navel. Cut between the clamps. For safety, use gauze tape to tie the cord 1 inch from the clamp towards the navel. Secure the tie with a square knot. Wrap the child in a warm sterile blanket. Log the time of the child's arrival.

The placenta (afterbirth) will deliver itself in 10-20 minutes. This can be aided by massaging the mother's lower abdomen. Do not pull on the placenta. Log the time of its delivery, and wrap it up for hospital analysis.

Place a small strip of tape (one-half inch wide), folded and inscribed with the date, time of delivery, and mother's name, around the baby's wrist.

COMPLICATIONS IN CHILDBIRTH

Breech Delivery

If the baby's legs and buttocks emerge first, follow the steps for a normal delivery, supporting the lower extremities with one hand. If the head does not emerge within 3 minutes, try to maintain an airway by gently pushing fingers into the vagina, pushing the vagina away from the face and opening the baby's mouth with one finger. Get medical aid immediately.

Prolapsed Cord

If the cord precedes the baby, protect it with moist, sterile wraps. If a doctor cannot be reached soon, place the mother in an extreme shock position, give her oxygen if available, and gently move your gloved hand into the vagina to keep its walls and the baby from compressing the cord. Get medical aid immediately.

Excessive Bleeding

If bleeding is severe, treat the mother for shock and give her oxygen. Place sanitary napkins over the vaginal entrance and rush her to a hospital.

Limb Presentation

If a single limb presents itself first, get the mother immediately to a hospital.

RESCUE AND TRANSPORTATION PROCEDURES

It is a basic principle of first aid that an injured person must be given essential treatment BEFORE being moved. However, it is impossible to treat an injured person that is in a position of immediate danger. If the victim is drowning, or if his or her life is endangered by fire, steam, electricity, poisonous or explosive gases, or other hazards, rescue must take place before first-aid treatment can be given.

The life of an injured person may well depend upon the manner in which rescue and transportation to a medical facility are accomplished. Rescue operations must be accomplished quickly, but unnecessary haste is both futile and dangerous. After rescue and essential first aid treatment have been given, further transportation must be accomplished in a manner that will not aggravate the injuries. As a corpsman it may be your responsibility to direct, and be the primary rescuer in, these operations. The life and safety of the victim and the members of the rescue team may rest on your decisions.

In this section, we will consider the use of common types of protective equipment, phases of rescue operations, ways of effecting rescue from dangerous situations, emergency methods of moving injured persons to safety, and procedures for transporting them after first aid has been given.

PROTECTIVE EQUIPMENT

The use of appropriate items of protective equipment will increase your ability to rescue a person from life-threatening situations. Protective equipment that is generally available on naval vessels and at some shore activities includes oxygen breathing apparatus; hose (air line) masks; protective (gas) masks; asbestos suits; steel-wire life lines; and devices for detecting oxygen insufficiency, explosive vapors, and some poisonous gases.

Oxygen Breathing Apparatus

An oxygen breathing apparatus (OBA) is provided for emergency use in compartments containing toxic gases and lacking sufficient oxygen to support life. The apparatus is particularly valuable for rescue purposes because it is a self-contained unit. The wearer is not dependent upon outside air or any type of air line within the effective life of the canister.

There are several types of oxygen breathing apparatus, but they are all similar in operation. Independence of the outside atmosphere is achieved by having air within the apparatus circulated through a canister. Within the canister the air is continuously replenished with oxygen and freed of impurities. The effective life of the canister varies from 20 to 45 minutes, depending on the particular apparatus and the type of work being done. One of the newer types of oxygen breathing apparatus is designed so that you can change canisters without leaving the toxic atmosphere.

If you are to enter an extremely hazardous area, you should also wear a lifeline. The lifeline should be tended by two persons, one of whom is also wearing a breathing apparatus.

Never allow oil or grease to come in contact with any part of an oxygen breathing apparatus. Oxygen is violently explosive in the presence of oil or grease. If any part of the apparatus becomes contaminated with oil or grease smudges, clean it before it is stowed. Care should be taken to prevent oil or oily water from entering the canister between the time it is opened and the time of disposal.

Hose (Air Line) Masks

Hose masks are part of the allowance of all ships having repair party lockers. They are smaller than the oxygen breathing outfits and can therefore be used by persons who must enter voids or other spaces that have very small access hatches. The hose or air line masks consists essentially of a gas mask facepiece with an adjustable head harness and a length of airhose. Note that the air line mask uses AIR, rather than pure oxygen. It must NEVER be connected to an oxygen bottle, oxygen cylinder, or other source of oxygen; even a small amount of oil or grease in the air line mask could combine rapidly with the oxygen and cause an explosion. When properly connected to a suitable source of air, such as the low-pressure ship's service air line, the hose mask can be worn safely, even in spaces containing a high concentration of oil or gasoline vapors; for this service, the air line mask is superior to the oxygen breathing apparatus.

Safety belts are furnished with each air line mask and MUST BE WORN. A lifeline must be fastened to the safety belt; and the lifeline should be loosely lashed to the airhose to reduce the possibility of fouling. The airhose and lifeline must be carefully tended at all times, so that they will not become fouled or cut. The person wearing the air line mask and the person tending the lines should maintain communication by means of standard divers signals.

Protective (Gas) Masks

Protective masks provide respiratory protection against chemical, biological, and radiological warfare agents. They do not provide protection from the effects of carbon monoxide, carbon dioxide, and a number of industrial gases. Protection from these gases is discussed in "Rescue From Unventilated Compartments."

In emergencies, protective masks may be used for passage through a smoke-filled compartment or for entry into such a compartment to perform a job that can be done quickly, such as close a valve, secure a fan, or de-energize a circuit. However, they provide only limited protection against smoke. The length of time you can remain in a smoke-filled compartment depends on the type of smoke and its concentration.

The most important thing to remember about protective masks is that they do not manufacture or supply oxygen. They merely filter the air as it passes through the canister. Therefore, the protective mask should not be used in air containing less than 16 percent oxygen, or in air having a heavy concentration of smoke from oil fires except for very short periods of time.

Asbestos Suits

The Navy asbestos suit is made in a single unit, is easy to get into, and provides complete cover for the wearer. With it on, a firefighter can move quickly through flame to effect a rescue or perform some other job that can be done quickly.

While asbestos will not burn, it will char and conduct heat. Therefore, the suit provides protection against flame only for short periods of time. The length of time the suit can be worn depends upon the conditions under which it is used. The person wearing the suit should return immediately to a safe, cool area if he or she experiences severe discomfort such as difficulty in breathing or extreme heat. Heavy clothing should be worn under the suit to give additional protection from heat.

If the asbestos suit becomes wet, as is more than likely in firefighting, the wearer might be scalded unless withdrawal from the heated area is accomplished before the water turns to steam. Continued wetting will keep the wearer cool, but the suit will become water-soaked and reduce freedom of movement, already restricted by the cumbersome suit.

Lifelines

The lifeline is a steel-wire cable, 50 feet long. Each end is equipped with a strong hook that closes with a snap catch. The line is very pliable and will slide freely around obstructions. See figure 4-77.

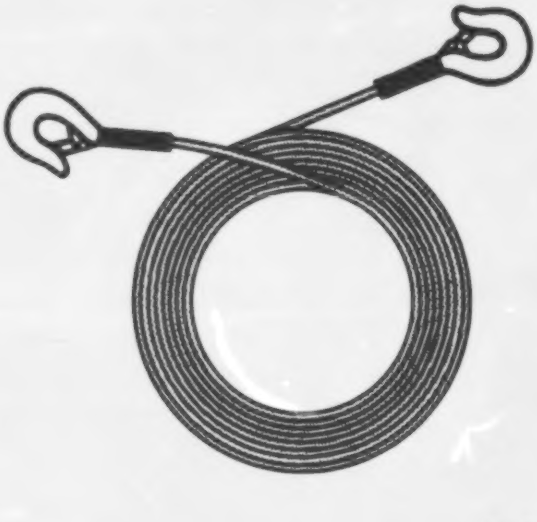

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Figure 4-77.—Steel wire lifeline.

Lifelines are used as a precautionary measure to aid in the rescue of persons wearing rescue breathing apparatus, hose masks, or similar equipment. Rescue, if necessary, should be accomplished by having another person equipped with a breathing apparatus follow the lifeline to the person being rescued, rather than by attempting to drag the person out. Attempts to drag a person from a space may result in fouling the lifeline on some obstruction or in parting the harness, in which case it would still be necessary to send a rescue person into the space.

An important point to remember is that a stricken person must never be hauled up by a lifeline attached to the waist. The victim may be dragged along the deck a short distance, but his or her weight must never be suspended on a line attached to the waist. If not wearing a harness of some kind, the line must be passed around the chest under the armpits and fastened in front or in back.

When tending a lifeline, you must wear gloves to be able to handle the line properly. Play out the line carefully, so that it will not foul. Try to keep the lifeline in contact with grounded metal; do not allow it to come in contact with any energized electrical equipment.

Detection Devices

The detection devices used to test the atmosphere in closed or poorly ventilated spaces include the FLAME SAFETY LAMP, for detecting oxygen deficiency; COMBUSTIBLE-GAS INDICATORS, for determining the concentration of explosive vapors; and TOXIC-GAS INDICATORS, such as the CARBON-MONOXIDE INDICATOR, for finding the concentration of certain poisonous gases. These devices are extremely valuable and should be used whenever necessary; however, they MUST BE USED ONLY AS DIRECTED. Improper operation of these devices may lead to false assurances of safety or, worse yet, to an increase in the actual danger of the situation. For example, the use of a flame safety lamp in a compartment filled with acetylene or hydrogen could cause a violent explosion.

RESCUE PROCEDURES

If you are faced with the problem of rescuing a person threatened by fire, explosive or poisonous gases, or some other emergency, do not take any action until you have had time to determine the extent of the danger and your ability to cope with it. In a large number of accidents the rescuer rushes in and becomes the second victim. Do not take unnecessary chances! Do not attempt any rescue that needlessly endangers your own life!

Phases of Rescue Operations

In disasters where there are multiple patients (as in explosions or ship collisions), rescue operations should be performed in phases. These rescue phases apply only to extrication operations.

The first phase is to remove lightly pinned casualties, such as those who can be freed by lifting boxes or removing a small amount of debris.

In the second phase remove those casualties who are trapped in more difficult circumstances but who can be rescued by use of the equipment at hand and in a minimum amount of time.

In the third phase remove casualties where extrication is extremely difficult and time-consuming. This type of rescue may involve cutting through decks, breaching walls, removing large amounts of debris, or cutting through an expanse of metal. An example would be rescuing a worker from beneath a large, heavy piece of machinery.

The last phase is the removal of dead bodies.

Stages of Extrication

The first stage of extrication within one of the rescue phases outlined above is gaining access to the victim. Much will depend on the location of the accident, damage within the accident site, and the position of the patient. The means of gaining access must also take into account the possibility of causing further injury to the patient since force may be needed. Further injury must be minimized.

The second stage involves giving lifesaving emergency care. If necessary, establish and maintain an open airway, start artificial respiration, and control hemorrhage.

The third stage is disentanglement. The careful removal of debris and other impediments from the victim will prevent further injury to both the victim and the rescuer.

The fourth stage is preparing the victim for removal, with special emphasis on the protection of possible fractures.

The final stage, removing the victim from the trapped area and transporting to an ambulance or sickbay, may be as simple as helping the victim walk out of the area or as difficult as a blanket drag out of a burning space.

Rescue From Fire

If you must go to the aid of a person whose clothing is on fire, try to smother the flames by wrapping the victim in a coat, blanket, or rug. Leave the head UNCOVERED. If you have no material with which to smother the fire, roll the victim over—SLOWLY—and beat out the flames with your hands. Beat out the flames around the head and shoulders, and then work downward toward the feet. If the victim tries to run, throw him or her down. Remember that the victim MUST lie down while you are trying to extinguish the fire. Running will cause the clothing to burn rapidly. Sitting or standing may cause the victim to be killed instantly in inhaling flames or hot air.

CAUTION: Inhaling flame or hot air can kill YOU, too. Don't get your face directly over the flames. Turn your face away from the flame when you inhale.

If your own clothing catches fire, roll yourself up in a blanket, coat, or rug. KEEP

YOUR HEAD UNCOVERED. If material to smother the fire is not available, lie down, roll over slowly, and beat the flames with your hands.

If you are trying to escape from an upper floor of a burning building, be very cautious about opening doors into hallways or stairways. Always feel a door before you open it; if it feels hot, don't open it if there is any other possible way out. Remember, also, that opening doors or windows will create a draft and make the fire worse; so don't open any door or window until you are actually ready to get out.

If you are faced with the problem of removing an injured person from an upper story of a burning building, you may be able to improvise a lifeline by tying sheets, blankets, curtains, or other materials together, using square knots. Secure one end around some heavy object inside the building, and fasten the other end around the casualty under the arms. You can lower the victim to safety and then let yourself down the line. Do not jump from an upper floor of a burning building except as a last resort.

It is often said that the "best" air in a burning room or compartment is near the floor, but this is true only to a limited extent. There is less smoke and flame down low, near the floor, and the air may be cooler; but carbon monoxide and other deadly gases are just as likely to be present near the floor as near the ceiling. If possible use an oxygen breathing apparatus or other protective breathing equipment when you go into a burning compartment. If protective equipment is not available, cover your mouth and nose with a wet cloth to reduce the danger of inhaling smoke, flame, or hot air. REMEMBER, HOWEVER, THAT A WET CLOTH GIVES YOU NO PROTECTION AGAINST POISONOUS GASES OR LACK OF OXYGEN!

Rescue From Steam-filled Spaces

It is sometimes possible to rescue a person from a space in which there is a steam leak. Since steam rises, escape upward may not be possible. If the normal exit is blocked by escaping steam, move the casualty to the escape trunk or, if there is none, to the lowest level in the compartment.

The equipment that offers protection against fire does NOT protect you against steam. In particular, it should be mentioned that the asbestos suit absorbs water and is therefore of no value in a steam-filled space. Steam would penetrate the asbestos very quickly, and the person wearing the suit would be scalded.

Rescue From Electrical Contact

Rescuing a person who has received an electric shock is likely to be difficult and dangerous. Extreme caution must be used, or you may be electrocuted yourself.

YOU MAY NOT TOUCH THE VICTIM'S BODY, THE WIRE, OR ANY OTHER OBJECT THAT MAY BE CONDUCTING ELECTRICITY.

Look for the switch first of all; if you find it, turn off the current immediately. Don't waste too much time hunting for the switch, however; every second is important.

If you cannot find the switch, try to remove the wire from the victim with a DRY broom handle, branch, pole, oar, board, or similar NONCONDUCTING object. It may be possible to use DRY rope or DRY clothing to pull the wire away from the victim. You can also break the contact by cutting the wire with a WOODEN-HANDLED axe, but this is extremely dangerous because the cut ends of the wire are likley to curl and lash back at you before you have time to get out of the way. When you are trying to break an electrical contact, always stand on some nonconducting material such as a DRY board, DRY newspapers, or DRY clothing (see fig. 4-75).

Rescue From Unventilated Compartments

Rescuing a person from a void, double bottom, gasoline or oil tank, or any closed compartment or unventilated space is generally a very hazardous operation. Aboard naval vessels and at naval shore activities, no person is permitted to enter any such space or compartment until a damage control officer (DCO), or some person designated by the DCO, has indicated that the likelihood of suffocation, poisoning, and fire or explosion has been eliminated as far as possible. The rescue of a person from any closed space should therefore be performed under the supervision of the DCO or in accordance with the DCO's instructions. In general, it is necessary to observe the following precautions when attempting to rescue a person from any closed or poorly ventilated space:

1. If possible, test the air for oxygen deficiency, poisonous gases, and explosive vapors.

2. Wear a hose (air line) mask or oxygen breathing apparatus. The air line mask is preferred for use in spaces that may contain high concentrations of oil or gasoline vapors. Do not depend upon a protective mask or a wet cloth held over your face to protect you from oxygen deficiency or poisonous gases.

3. Before going into a compartment that may contain explosive vapors, be sure that people are stationed nearby with fire-extinguishing equipment.

4. When going into any space that may be deficient in oxygen or contain poisonous or explosive vapors, be sure to maintain communication with someone outside. Wear a lifeline, and be sure that it is tended by a competent person.

5. Do not use, wear, or carry any object or material that might cause a spark. Matches, cigarette lighters, flashlights, candles or other open flames, and ordinary electrical lights must NEVER be taken into a compartment that may contain explosive vapors. The kind of portable light used by cleaning parties in boilers, fuel tanks, and similar places may be taken into a suspect compartment; this is a steam-tight, glove-type light whose exposed metal parts are either made of nonsparking alloy or protected in some way so that they will not strike a spark.

Electrical apparatus or tools that might spark must never be taken into a compartment until a DCO has indicated that it is safe to do so. When electrical equpment is used (for example, an electric blower might be used to vent a compartment of explosive vapors) it must be explosion-proof and properly grounded.

If you must go into a space that may contain explosive vapors, do not wear clothing that has any exposed spark-producing metal. For example, do not wear boots or shoes that have exposed nailheads or rivets, and do not wear coveralls or other garments that might scrape against metal and cause a spark.

A particular caution must be made concerning the use of the steelwire lifeline in compartments that may contain explosive vapors. If you use the line, be sure that it is carefully tended and properly grounded at all times. When other considerations permit, you should use a rope line instead of the steel-wire lifeline when entering compartments that may contain explosive vapors.

Rescue From the Water

You should never attempt to swim to the rescue of a drowning person unless you have been trained in lifesaving methods—and then only if there is no better way of reaching the victim. A drowning person may panic and fight against you so violently that you will be unable either to carry out the rescue or to save yourself. Even if you are not a trained lifesaver, however, you can help a drowning person by holding out a pole, oar, branch, or stick for the victim to catch hold of or by throwing a lifeline or some buoyant object which will support the victim in the water.

Various methods are used aboard ship to pick up survivors from the water. The methods used in any particular instance will depend upon weather conditions, the type of equipment available aboard the rescue vessel, the number of people available for rescue operations, the physical condition of the people requiring rescue, and other factors. In many cases it has been found that the best way to rescue a person from the water is to send out a properly trained and properly equipped swimmer with a lifeline.

It is frequently difficult to get survivors up to the deck of the rescuing vessel, even after they have been brought alongside the vessel. Cargo nets are often used, but many survivors are unable to climb them without assistance. Persons equipped with lifelines (and, if necessary, dressed in antiexposure suits) can be sent over the side to help survivors up the nets. If survíviors are covered with oil, it may take the combined efforts of four or five people to get one survivor up the net.

A seriously injured person should never, except in an extreme emergency, be hauled out of the water by means of a rope or lifeline. Special methods must be devised to provide proper support, to keep the victim in a horizontal position, and to provide protection from any kind of jerking, bending, or twisting motion. The Stokes stretcher (described later in this chapter) can often be used to rescue an injured survivor. The stretcher is lowered into the water, and the survivor is floated into position over it. People on the deck of the ship can then bring the stretcher up by means of handlines. Life preservers, balsa wood, unicellular material, or other flotation gear can be used if necessary to keep the stretcher afloat.

Moving the Victim to Safety

In an emergency there are many ways to move a victim to safety, ranging from one-person carries to stretchers and spineboards. The victim's condition and the immediacy of danger will dictate the appropriate methods, but remember to give all necessary first aid BEFORE moving the victim.

Stretchers

The military uses a number of standard stretchers. The following discussion will familiarize you with the most common types. When using a stretcher, a few general rules should be kept in mind:

1. Use standard stretchers when available, but be ready to improvise safe alternatives.

2. When possible, bring the stretcher to the casualty.

3. Always fasten the victim securely to the stretcher.

4. Always move the victim FEET FIRST so the rear bearer can watch for signs of breathing difficulty.

Stokes Stretcher

The Navy service litter most commonly used for transporting sick or injured persons is called the Stokes stretcher. As shown in figure 4-78, the Stokes stretcher is essentially a wire basket supported by iron or aluminum rods, but a new version is made of molded plastic. It is adaptable to a variety of uses, since the casualty can be held securely in place even if the stretcher is tipped or turned. The Stokes stretcher is particularly valuable for transferring injured persons to

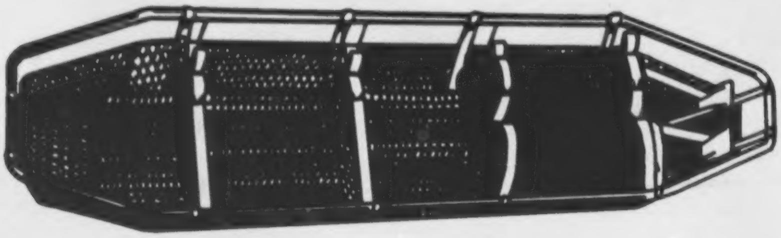

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Figure 4-78.—Stokes stretcher.

and from boats. As mentioned before, it can be used with flotation devices to rescue injured survivors from the water. It is also used for direct ship-to-ship transfer of injured persons. Fifteen-foot handling lines are attached to each end for shipboard use in moving the victim.

The Stokes stretcher should be padded with three blankets: two of them should be placed lengthwise, so that one will be under each of the casualty's legs, and the third should be folded in half and placed in the upper part of the stretcher to protect the head and shoulders. The casualty should be lowered gently into the stretcher and made as comfortable as possible. The feet must be fastened to the end of the stretcher so that the casualty will not slide down. Another blanket (or more, if necessary) should be used to cover the casualty. The casualty must be fastened to the stretcher by means of straps that go over the chest, hips, and knees. Note that the straps go OVER the blanket or other covering, thus holding it in place.

Army Litter

The Army litter, shown in figure 4-79, is a collapsible stretcher made of canvas and supported by wooden or aluminum poles. It is very useful for transporting battle casualties in the field. However, it is sometimes difficult to fasten the casualty onto the Army litter, and for this reason its use is somewhat limited aboard ship. The litter legs keep the patient off the ground and fit into the restraining tracks of a jeep or field ambulance to hold the litter in place during transport.

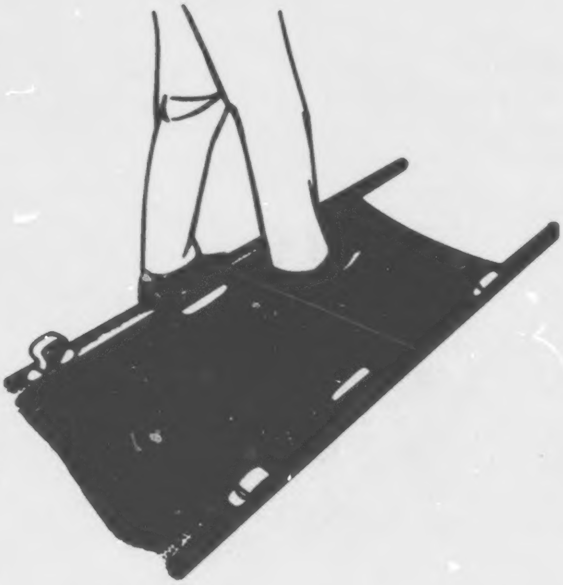

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Figure 4-79.—Opening an Army litter.

Neil Robertson Stretcher

The Neil Robertson stretcher is especially designed for removing an injured person from engine rooms, holds, and other compartments where access hatches are too small to permit the use of regular stretchers. You can also use it to hoist a casualty aboard a hovering helicopter by attaching a rescue line.

The Neil Robertson stretcher is made of semirigid canvas with sewn-in wooden slats sown the length of the stretcher. When firmly wrapped around the casualty mummy-fashion, it gives sufficient support for a vertical lift. (See fig. 4-80.) Note that a guideline is tied to the bottom ring to keep the casualty from swaying against bulkheads and hatchways while being lifted.

Stretchers of this type can be made on board ship and kept in appropriate places ready for use. If a Neil Robertson stretcher is not available when needed, a piece of heavy canvas, wrapped firmly around the casualty, will serve somewhat the same purpose. Periodically check your ships Neil Robertson stretchers for dry rot or other damage caused by humidity, sea water, or handling.

Improvised Stretchers

Standard stretchers should be used whenever possible to transport a seriously injured person. If none are available, it may be necessary for you to improvise. Shutters, doors, boards, and even ladders may be used as stretchers. All stretchers of this kind must be very well padded; and great care must be taken to see that the casualty is fastened securely in place.

Sometimes a blanket may be used as a stretcher, as shown in figure 4-81. The casualty is

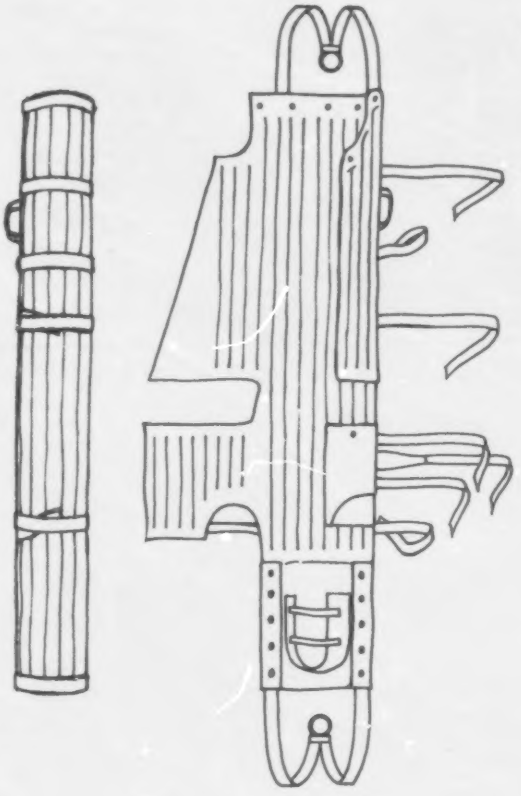

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Figure 4-80.—Neil Robertson stretcher.

placed in the middle of the blanket in the supine position. Three or four people kneel on each side and roll the edges of the blanket toward the casualty, as shown in figure 4-81(A). When the rolled edges are tight and large enough to grasp securely, the casualty should be lifted and carried, as shown in figure 4-81(B).

Stretchers may also be improvised by using two long poles (about 7 feet long) and any strong cloth, such as a rug, a blanket, a sheet, a mattress cover, two or three gunny sacks, or two coats. Figure 4-82 shows an improvised stretcher made from two poles and a blanket.

CAUTION: Many improvised stretchers do not give sufficient support in cases where there are fractures or extensive wounds of the body. They should be used only when the casualty is able to stand some sagging, bending, or twisting without serious consequences. An example of this type of improvised stretcher would be one made of 40 or 50 feet of rope or 1 1/2-inch fire hose (figure 4-83).

Spineboards

Spineboards are essential equipment in the immobilization of suspected or real fractures of the spinal column. Made of fiberglass or exterior plywood, they come in two sizes, short (18″ x 32″) and long (18″ x 72″), and are provided with handholes and straps. See figure 4-84.

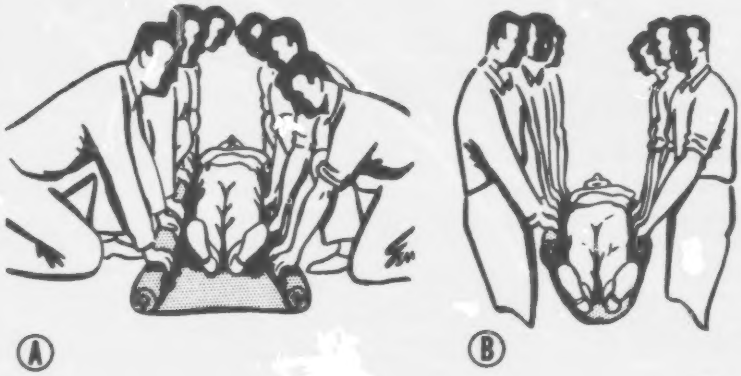

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Figure 4-81.—Blanket used as an improvised stretcher.

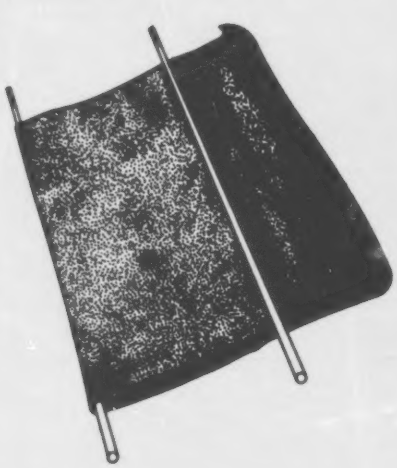

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Figure 4-82.—Improvised stretcher using blankets and poles.

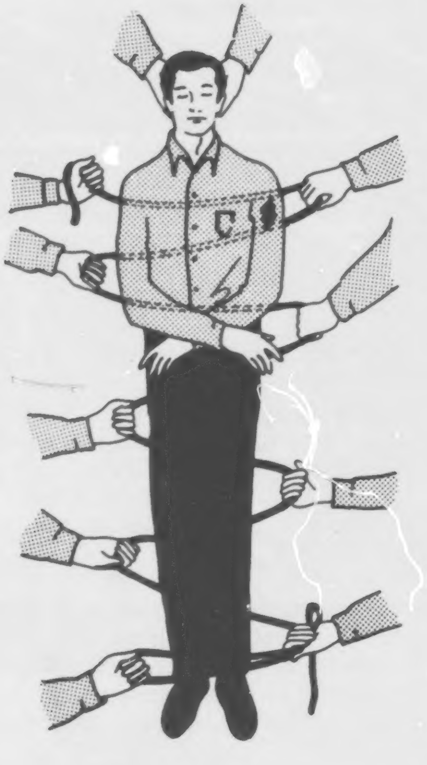

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Figure 4-83.—Improvised stretcher using rope or firehose.

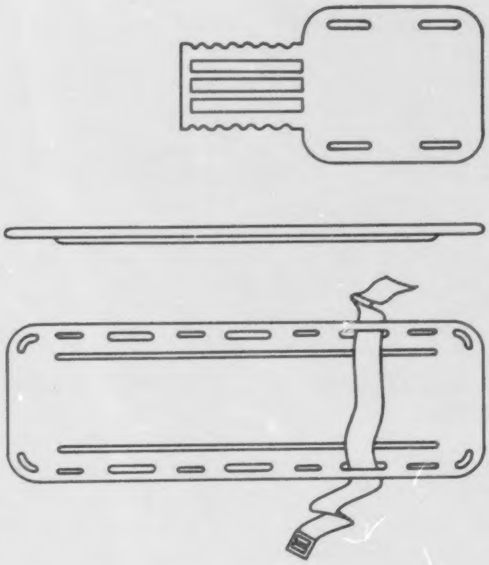

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Figure 4-84.—Spineboards.

A short spineboard is primarily used in the extrication of sitting victims, especially in auto wrecks, where it would be difficult to maneuver the victim out of position without doing additional damage to the spine. The long board makes a firm litter, protecting back and neck, and providing a good surface for CPR and a good sliding surface for difficult extrications.The short and the long boards are often used together. For example at an auto accident site, the corpsman's first task is to assess the whole situation and to plan the rescue. If bystanders must be used, it is essential that they be thoroughly briefed on what you want them to do. After all accessible bleeding has been controlled and the fractures splinted, the short spineboard should be moved into position behind the victim. A neck collar will aid in the immobilization of the head and neck. The head should then be secured to the board with a head band and chin strap, or a 6-inch self-adhering roller bandage. The victim's body is then secured to the board by use of the supplied straps around the chest and thighs. The victim may then be lifted out. If, however, the victim is too large, or further immobilization of the lower extremities is necessary, the long spineboard may be slid at a right angle behind the short spineboard, and the victim is maneuvered onto his or her side and secured to the long board.

The possible uses of the spineboard in an emergency situation are limited only by the imagination of the rescuers.

Lifts, Drags, and Carries

Emergency Rescue Lines. As previously mentioned, the steel-wire lifeline can often be used to haul a person to safety. An emergency rescue line can also be made from any strong fiber line. Both should be used only in extreme emergencies, when an injured person must be moved and no other means is available.

Figure 4-85 shows an emergency rescue line that could be used to hoist a person from a void or small compartment. Notice that a running bowline is passed around the body, just below the hips, and a half hitch is placed just under the arms. Notice also that a guideline is tied to the casualty's ankles to prevent banging against bulkheads and hatchways.

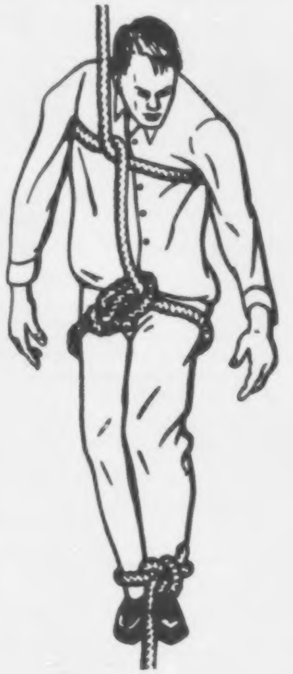

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Figure 4-85.—Hoisting a person.

Fireman's Carry. One of the easiest ways to carry an unconscious person is by means of the fireman's carry. Figure 4-86 shows the procedure:

1. Place the casualty in the prone position, as shown in figure 4-86(A). Face the victim, and kneel on one knee at his or her head. Pass your hands under the armpits; then slide your hands down the sides and clasp them across the back.
2. Raise the casualty to the kneeling position as shown in figure 4-86(B). Take a better hold across the back.
3. Raise the casualty to a standing position and place your right leg between the legs, as shown in figure 4-86(C). Grasp the right wrist in your left hand and swing the arm around the back of your neck and down your left shoulder.
4. Stoop quickly and pull the casualty across your shoulders and, at the same time, put your right arm between the legs, as shown in figure 4-86(D).

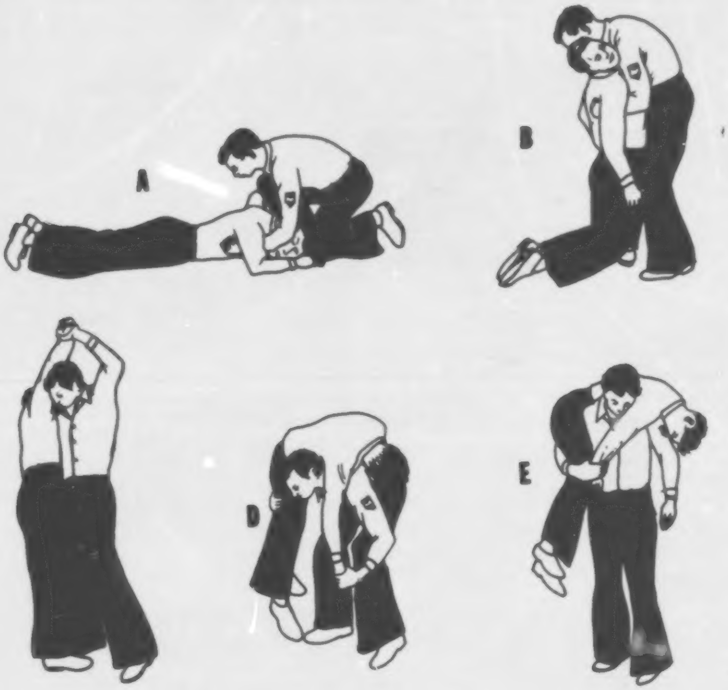

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Figure 4-86.—Fireman's carry.

5. Grasp the right wrist with your right hand and straighten up, as shown in figure 4-86(E).

Tied-Hands Crawl. The tied-hands crawl, shown in figure 4-87, may be used to drag an unconscious person for a short distance; it is particularly useful when you must crawl underneath a low structure.

To be carried by this method, the casualty must be in the supine position. Cross the wrists and tie them together. Kneel astride the casualty and lift the arms over your head so that the wrists are at the back of your neck. When you crawl forward, raise your shoulder high enough so that the casualty's head will not bump against the deck.

Blanket Drag. The blanket drag, shown in figure 4-88, can be used to move a person who, due to the severity of the injury, should not be lifted or carried by one person alone. Place the casualty in the supine position on a blanket and pull the blanket along the floor or deck. Always pull the casualty head first, with the head and shoulders slightly raised, so that the head will not bump against the deck.

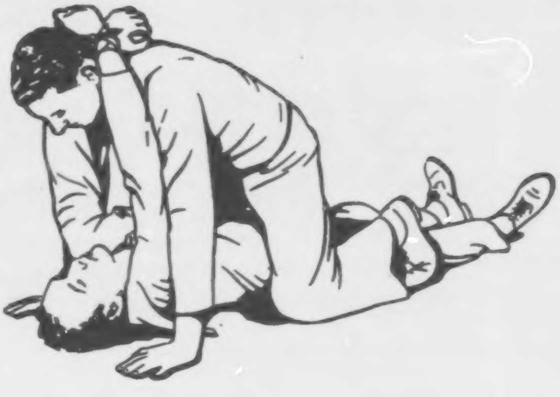

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Figure 4-87.—Tied hands crawl.

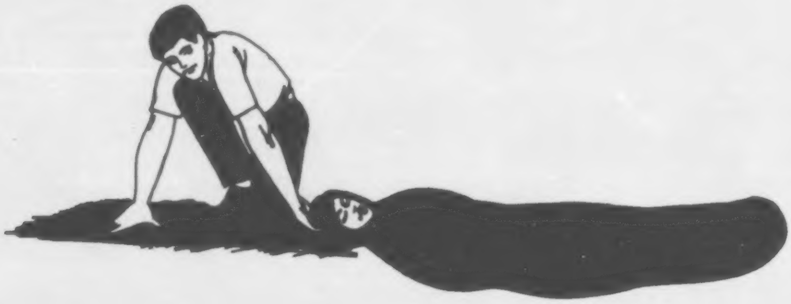

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Figure 4-88.—Blanket drag.

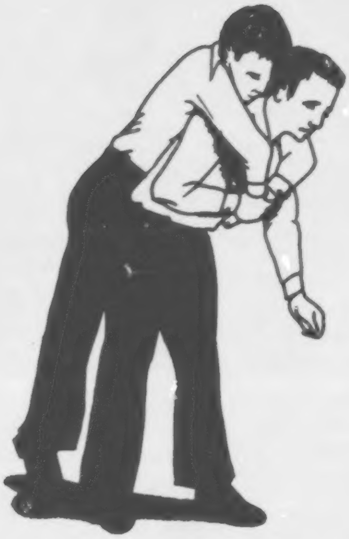

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Figure 4-89.—Packstrap carry.

Pack-strap Carry. With the pack-strap carry, shown in figure 4-89, it is possible to carry a heavy person for some distance. Use the following procedure:

1. Place the casualty in the supine position.
2. Lie down on your side along the casualty's uninjured or less injured side. Your shoulder should be next to the casualty's armpit.

3. Pull the casualty's far leg over your own, holding it there if necessary.

4. Grasp the casualty's far arm at the wrist and bring it over your upper shoulder as you roll and pull the casualty onto your back.

5. Rise up on your knees, using your free arm for balance and support. Hold both of the casualty's wrists close against your chest with your other hand.

6. Lean forward as you rise to your feet, and keep both of your shoulders under the casualty's armpits.

Do not attempt to carry a seriously injured person by means of the pack-strap carry, especially if the arms, spine, neck, or ribs are fractured.

Chair Carry. The chair carry can often be used to move a sick or injured person away from a position of danger. The casualty is seated on a chair, as shown in figure 4-90, and the chair is carried by two rescuers. This is a particularly good method to use when you must carry a person up or down stairs or through narrow, winding passageways. It must NEVER be used to move a person who has an injured neck, back, or pelvis.

Arm Carries. There are several kinds of arm carries that can be used in emergency situations

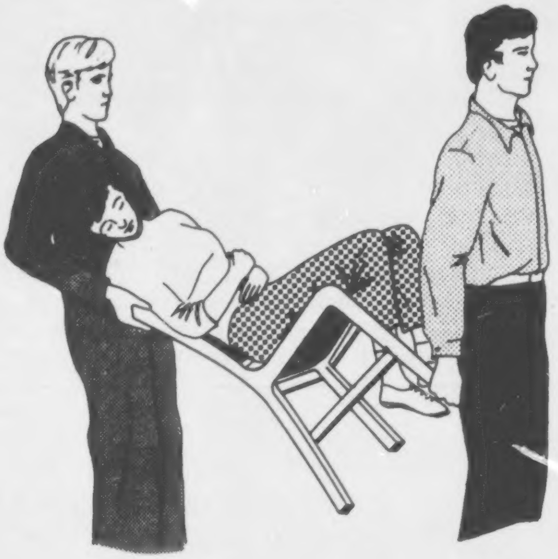

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Figure 4-90.—Chair carry.

to move an injured person to safety. Figure 4-91 shows how one person can carry the casualty alone. However, you should never try to carry a person this way who is seriously injured. Unless considerably smaller than you are, you will not be able to carry the casualty very far by this method.

The two-person arm carry, shown in figure 4-92 and 4-93, can be used in some cases to move an injured person. However, it should not be used to carry a person who has serious wounds or broken bones.

Another two-person carry that can be used in emergencies is shown in figure 4-94. Two rescuers position themselves beside the casualty, on the same side, one at the level of the chest and the other at the thighs. The rescuers interlock their adjacent arms as shown, while they support the victim at the shoulders and knees. In unison they lift the victim and roll his or her front towards theirs. This carry must not be used to move seriously injured persons.

TRANSPORTATION OF THE INJURED

Thus far in this chapter we have dealt with EMERGENCY methods used to move an injured person out of danger and into a position where first aid can be administered. As we have seen, these emergency rescue procedures often involve substantial risk to the casualty and should be used ONLY when clearly necessary.

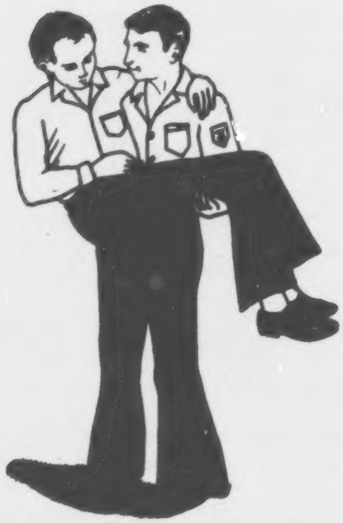

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Figure 4-91.—One person arm carry.

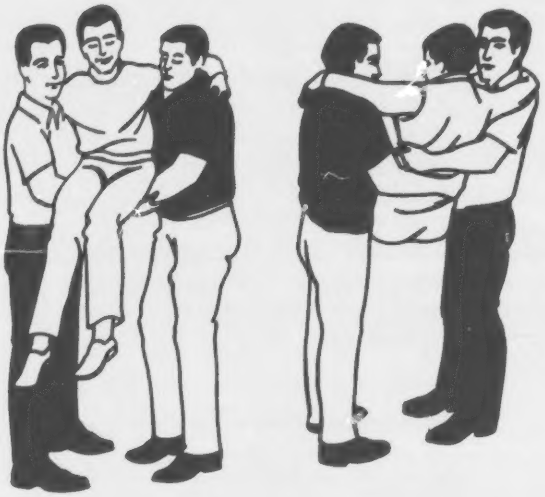

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Figure 4-92.—Two person arm carry.

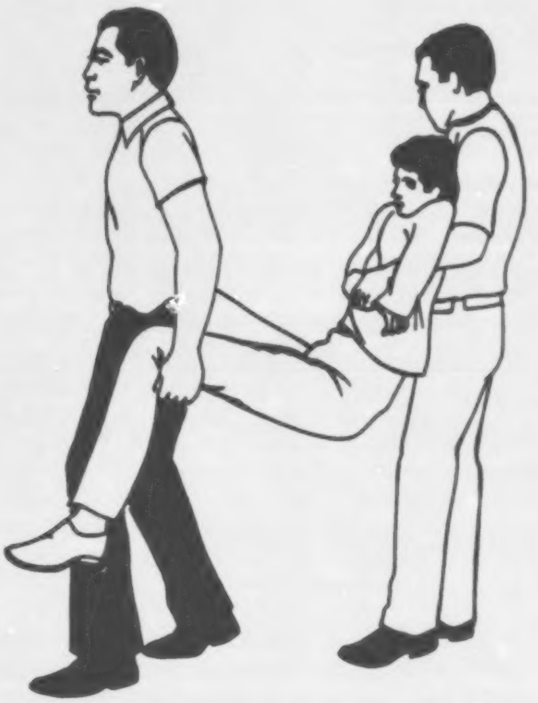

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Figure 4-93.—Two person arm carry (alternate).

Once you have rescued the casualty from the immediate danger, SLOW DOWN! From this point on handle and transport the casualty with every regard for the injuries which have been sustained. In the excitement and confusion that almost always accompany an accident, you are likely to feel rushed, wanting to do everything rapidly. To a certain extent this is a reasonable feeling. Speed is essential in treating many injuries and in getting the casualty to a medical facility. However, it is not reasonable to let yourself feel so hurried that you become careless and transport the victim in a way that will aggravate the injuries.

Emergency Vehicles, Equipment, and Supplies

In most peacetime emergency situations, some form of ambulance will be available to transport the victim to a medical facility. Navy ambulances vary in size and shape from the old "gray ghosts" to modern vans and modular units. Although there are many differences in design and storage capacity, most Navy ambulances are equipped to meet the same basic emergency requirements. They contain equipment and supplies for emergency airway care, artificial ventilation, suction, oxygenation, hemorrhage control, fracture immobilization, shock control, blood pressure monitoring, and poisoning. They will also contain a wheeled litter, an army litter, and both long and short spineboards. Supplies you may find include:

Airways—Oropharyngeal airways come in sizes for adults, children, and infants. Their use was discussed earlier in this chapter. In addition, padded tongue blades for convulsive seizures, and tracheostomy tubes for victims with a tracheostomy will be provided.

Artificial Ventilation Devices—Ambu-Bag (1-2) with masks of different sizes and oxygen enrichment capability.

Suction Equipment—Portable and/or installed suction equipment for pharyngeal and tracheostomy suction, with tubes, tips, and collection bottles.

Oxygen Supply—A portable unit with an extra cylinder and masks of different sizes.

Hemorrhage Control—Sterile gauze pads, battle dressings, soft self-adhering roller bandages, adhesive tape, safety pins, and bandage scissors.

Splinting Supplies—Various materials for upper and lower extremity splints, and triangular bandages.

~~Shock~~ Control—IV fluids in unbreakable containers, and administration kits, as determined by local directives.

Blood Pressure Monitoring—Blood pressure cuff and sphygmomanometer.

Poison Response—Ipecac syrup in measured doses.

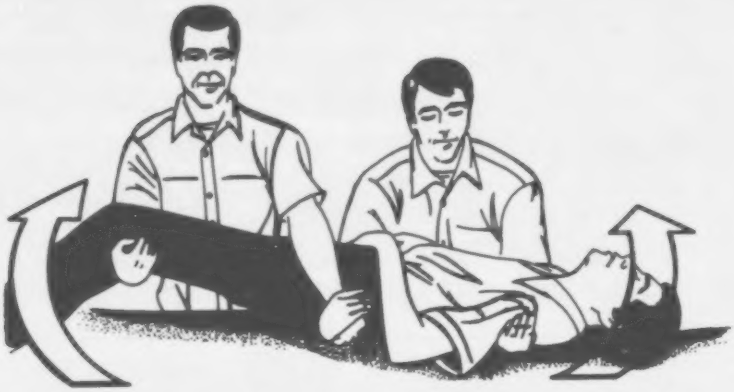

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Figure 4-94.—Two person arm carry (alternate).

Spineboard—Long and short for spinal immobilization, extrication, and as a CPR surface.

Deployed units at sea and in the field and certain commands near air stations will also have access to helicopter MEDEVAC support. Helicopters are ideal for use in isolated areas but are of limited practical use at night, in adverse weather, and certain tactical conditions, or in developed areas where buildings and power lines interfere. In addition to taking these factors into consideration, the corpsman must decide if the victim's condition is serious enough, or too serious, to justify a call for the helicopter. Some injuries require very smooth transportation or are affected by the pressure changes incurred in flight. The final decision will be made by the unit commander, who is responsible for requesting the helicopter support.

Field operational units will have access to field ambulances, jeeps, and "gamma-goats" for casualty transportation. They have room for 2 to 4 army litters and are used for behind-the-lines movement.

Care En Route

The emergency care a corpsman can offer patients en route is limited only by the availability of supplies, the level of external noise and vibrations, and the degree of skill and ingenuity the corpsman possesses.

Care at the Medical Facility

Do not turn the victim over to anyone without giving a complete account of the situation, especially if a tourniquet was used or medications administered. If possible, while en route, write down the circumstances of the accident, the treatment given, and keep a log of vital signs. After turning the patient over to the medical facility, ensure that depeleted ambulance supplies are replaced so that the vehicle is in every way ready to handle another emergency.

CHAPTER 5

PATIENT CARE

INTRODUCTION

Twentieth century advances in the medical and technological sciences have made a significant impact on the methods of marketing health care services. The numbers and kinds of health care providers have expanded greatly. The consumers have become more informed regarding both their health care needs and expectations. Additionally, the consumer has become more vocal, seeking answers for both the what's and why's of the entire spectrum of health care services.

The goal of this chapter is to provide the hospital corpsman with a limited amount of theory concerning the multidisciplinary aspects of patient care. It is an introduction to some of the more critical basic concepts applicable to providing care to individuals whose physical or psychological needs have motivated them to seek some kind of health care service.

Personnel seeking information concerning the how and what to do regarding a specific procedure will find step by step instructions in the *Nursing Procedures Manual,* NAVMED P-5066, June 1980 edition. Use of both the *Nursing Procedures Manual* and the *Hospital Corpsman 3 & 2 Rate Training Manual* will not only assist the hospital corpsman in advancing in rate but more importantly will prepare him or her to provide safe and effective health care services.

HEALTH AND ILLNESS

To intelligently and skillfully discharge your duties as a member of the Navy Medical Department health care team, it is critical that you first understand the concepts of health and illness.

The concept of health includes the physical, mental, and emotional condition of a human being that provides for the normal and proper performance of one's vital functions. Health is not only the absence of disease or disability but also a state of soundness of the body, mind, and spirit.

On the other hand, the concept of illness includes those conditions often accompanied by pain or discomfort that inhibit a human being's ability to physically, mentally, or emotionally perform in a normal and proper manner.

In most cultures when people need assistance in maintaining their health, dealing with illness, or coping with problems related to health and illness, they seek assistance from personnel specialized in the fields of health care.

In chapter 1, the concepts of the health care team was briefly introduced. Although doctors, nurses, and hospital corpsmen are frequently referred to as the core team, all health and allied health personnel comprise the total health care team. Obviously each member of the team uses his or her skills differently, depending upon their personal, professional, and technical preparation and experience. Nevertheless, despite the differences in clinical expertise, they all share one common objective, that is, to respond to the consumer's health needs. The overall goal of this response is to assist the consumer to maintain, sustain, restore, or rehabilitate a physical or psychological function.

THE PATIENT

No discussion about health care or the health care team would be complete without including the patient, often referred to as the consumer. A patient may be defined as a human being under the care of one or more health care providers. The patient may or may not be hospitalized. However, regardless of their health care needs or environmental disposition—they are the most important part of the health care team. Without the patient, the health care team has little, if any, reason for existence.

As a hospital corpsman, you are tasked to provide every patient committed to your charge with the best care possible. This care must reflect your belief in the value and dignity of every person as an individual human being. Additionally, you must be knowledgeable about both the patient's rights and responsibilities as they apply to the providing and receiving of health care services.

The Joint Commission on Accreditation of Hospitals (JCAH) has developed standards that address both the rights and responsibilities of patients. Because the goal of JCAH is the continual promotion of excellence in the providing of health care services, these goals are compatible with those of the Navy Medical Department. The following breakout is a brief summary of some of the major rights and responsibilities of patients when they enter into a relationship with a health care services facility. Students seeking additional information are referred to the Accreditation Manual for Hospitals that is published by the JCAH.

- Patient's Rights
  - Access to care
  - Respect and dignity
  - Privacy and confidentiality
  - Personal safety
  - Consent
  - Hospital (facility) rules and regulations
- Patient's Responsibilities
  - Provision of information
  - Compliance with instructions
  - Hospital (facility) rules and regulations
  - Respect and consideration

The above listing is in no way intended to be all inclusive. It is, however, an introduction that emphasizes the need for the observance of rights and responsibilities of patients when engaged in a provider-consumer relationship.

PROFESSIONAL ETHICS

The word ethics is derived from the Greek "ethos" that means custom or practice, a characteristic manner of acting, or a more or less constant style of behavior in the deliberate actions of people. When we speak of ethics, we refer to a set of rules or a body of principles. Each social, religious, and professional group has a body of principles or standards of conduct that provide ethical guidance to its members.

During your indoctrination into the military, you were introduced to the Code of the U.S. Fighting Forces. This code of conduct is an ethical guide that charges you with certain high standards of general behavior as a member of the Armed Forces.

All professional interactions must be directly related to certain codes of behavior that support the universal principles of justice, equality of human beings, and respect for the dignity of human beings as persons. In chapter 1 of this manual, professional ethics in relation to your responsibilities as a hospital corpsman was briefly discussed. Upon completion of basic Hospital Corps School you took the following pledge.

> "I solelmnly pledge myself before God and these witnesses to practice faithfully all of my duties as a member of the Hospital Corps. I hold the care of the sick and injured to be a privilege and a sacred trust and will assist the Medical Officer with loyalty and honesty. I will not knowingly permit harm to come to

> any patient. I will not partake nor administer any unauthorized medication. I will hold all personal matters pertaining to the private lives of patients in strict confidence. I dedicate my heart, mind, and strength to the work before me. I shall do all within my power to show in myself an example of all that is honorable and good throughout my naval career."

The Hospital Corpsman Pledge morally binds you to certain responsibilities and rules that are included in the science of health care ethics. Health care ethics is not unique in the development of methods, assumptions, and principles. Ethics, whether they be classified general or special (e.g., legal, medical), teach us how to judge accurately the moral rightness or wrongness of our actions. The one element that makes health care ethics different from general ethics is the inclusion of the moral rule "Do your duty." This is a moral rule because it involves expectations (e.g., confidentiality). It involves what others have every reason to believe will be forthcoming. To fail in fulfilling these expectations of others is to harm them. Through the Hospital Corpsman Pledge you committed yourself to fulfilling certain duties, not only to those entrusted to your care but also to all members of the health care team. It is this commitment to service and to human beings that has traditionally distinguished the United States Navy Hospital Corps wherever its members have served.

INTERPERSONAL RELATIONS

As a health care provider, you must be able to identify, understand, master, and use various kinds of information and scientific skills. In addition to information data and scientific skills, it is also very important that you develop a special kind of skill called interpersonal relations. In providing total patient care, it is important that you see the individual not only as a biological being but also as a thinking, feeling person. Your commitment to this concept is the key to the development of good interpersonal relationships.

Simply stated, your interpersonal relationships are the result of how you regard and respond to people. Many elements influence the development of that regard and those responses. In the following discussion, some of these elements will be discussed as they apply to your involvement in the military service and your relationships with other health care providers and the consumer.

CULTURE

Because of the cross-cultural nature and military mission of the Navy Medical Department, you will frequently encounter members of various cultures. Culture may be defined as a group of socially learned, shared standards (norms) and behavior patterns. Things such as perceptions, values, beliefs, and goals are examples of shared norms; whereas, health practices, eating habits, and personal hygiene reflect common behavior patterns of specific groups of people. An understanding of common norms and behavior patterns enhances the quality and often quantity of service a provider is able to make available. An individual's cultural background has an effect on every area of health care services, ranging from a simple technical procedure to the content and effectiveness of health education activities. Becoming familiar with the beliefs and practices of different cultural and subcultural groups (the military community for example) is not only enriching to the health care provider but promotes an understanding and acceptance of the various peoples in the world community.

RACE

The term race is a classification assigned to a group of people who share inherited physical characteristics. This term becomes a socially significant reality since people tend to attach great importance to assuming or designating a racial identity. Information identifying racial affiliation can be an asset to the health care provider in assessing the patient's needs, carrying out direct care activities, and planning and implementing patient education programs. Racial identification has the potential to create a negative environment in the health care setting

189

when factors such as skin color differences motivate prejudicial and segregational behaviors. When this is permitted to occur, it creates an environment that feeds a multitude of social illnesses and destructive behaviors. In the Navy Medical Department, no expressions or actions based on prejudicial attitudes will be tolerated.

It is both a moral and legal responsibility of the health care provider to render services with respect for the life and human dignity of the individual without regard to race, creed, sex, political views, or social status.

RELIGION

A large majority of people have some form of belief system that guides many of their life decisions and to which they turn to in times of distress. A person's religious beliefs frequently help give meaning to suffering and illness; they also may be helpful in the acceptance of future incapacities or death.

Close contact with illness and death can increase our awareness of our own mortality and that of our patients. For some there will be heightened religious involvement and for others a sense of frustration or loneliness. It is important for health care personnel to be aware of this to meet the needs of patients, co-workers, and even ourselves. We must accept in a nonjudgmental way the religious or nonreligious beliefs of others as valid for them, even if we personally disagree with such beliefs. Although we may offer religious support when asked and should always provide chaplain referrals when requested or indicated, it is not ethical for us to abuse our patients by forcing our beliefs (or nonbeliefs) upon them. We must respect their freedom of choice, offering our support for whatever their needs or desires may be.

SEX

An individual is born either male or female and learns roles and responses associated with their gender through parental models, family relationships, and their specific society. As one enters into the world of providing health care services, it is necessary to learn and adopt new roles and responses regarding gender identification. As the number of females entering the military service increases, health care providers are increasingly being challenged to expand their functions in relation to caring for patients of the opposite sex. The health care provider who has developed sound moral principles and consciously strives to provide a service based on a firm ethical foundation has little to fear when providing care for an individual of either sex. However, the development of such a foundation requires diligent study, a commitment to growth, and an availability of professionally guided experiences. Throughout your career as a member of the Hospital Corps, you will be given opportunities and guidance to achieve a sound ethical background. Your only responsibility towards this growth is a desire and commitment to make yourself available and respond as a real professional.

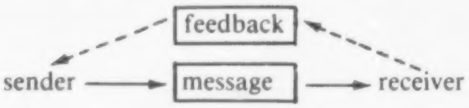
Because of the increasing frequency with which Hospital Corps personnel are required to attend to persons of either sex, the following guidelines are presented to assist you in developing some decision-making judgments.

To ensure the protection of health care personnel from unjustified accusations, a witness should be present when a female is being examined or treated by a male. Whether this witness is a female or not may be dictated by the availability of personnel. When caring for a patient, sensitivity to both verbal and nonverbal communication is paramount. A grin, a frown, or an expression of surprise may all be misinterpreted by the patient. Explanations and reassurances will go far in preventing misunderstandings of actions or intentions. Knowledge, empathy, and mature judgment should guide the care provided to any patient; this is especially crucial when the care involves touching. As a member of the health care team, you are responsible for providing complete, quality care to all who need and seek your service. This care must be provided in a manner compatible with your individual legal and technical limitations.

COMMUNICATION SKILLS

Communication is a highly complicated interpersonal process of people relating to each other through conversation, writing, gestures, appearance, behavior, and at times, even silence. Such interpersonal relating not only occurs among health care providers and patients but also between health care providers and support personnel. Some of these support personnel include housekeeping, maintenance, security, supply, and food service staff. Another critical communication interaction occurs between health care providers and visitors. Because of the critical nature of communication in health care delivery, it is important that the hospital corpsman understand the communication process and the techniques used to promote open, honest, and effective interactions. It is only through effective communication that the health care provider is able to identify the goals of the individual and the Navy health care system.

The human communication process consists of four basic parts: the sender of the message, the message, the receiver of the message, and the feedback. The sender of the message starts the process.



The receiver is that individual intended to receive the message. The message is that body of information the sender wishes to transmit to the receiver. Feedback is the response given by the receiver to the message. It can be a way of validating that effective communication has taken place.

There are two basic modes of communication, verbal and nonverbal. Verbal communication is that which is spoken or written. A characteristic that distinguishes the verbal from the nonverbal is that verbal communication involves the use of words. Nonverbal communication, on the other hand, does not involve the use of words. Dress, gestures, touching, body language, face and eye behavior, and even silence are forms of nonverbal communication. It should be remembered that even though there are two forms of communication, both the verbal and nonverbal are inseparable in the total communication process. Conscious awareness of this aspect is extremely important for the health care provider whose professional effectiveness is highly dependent upon successful communication.

Ineffective communication occurs when obstacles or barriers are present. These barriers can be classified as physiological, physical, or psychosocial. Physiological barriers are those that result from some kind of sensory dysfunction on the part of either the sender or the receiver. Such things as hearing impairments, speech defects, and even vision problems influences the effectiveness of communication. Physical barriers consist of elements in the environment (such as noise) that frequently contribute to the development of physiological barriers (such as an inability to hear). The final kind of obstacles, called psychosocial barriers, are usually the result of one's inaccurate perception of self or others, the presence of some defense mechanism an individual employs to cope with some form of threatening anxiety, or factors such as age, education, culture, language, nationality, and a multitude of other socioeconomic factors. This last category of barriers is the most difficult to identify and the most common cause of communication failure or breakdown.

Listening is a critical element of the communication process and becomes a primary activity for the health care provider who must use communication as a tool for collecting or giving information. When one is engaged in listening, it is important to direct attention to both the verbal and nonverbal cues provided by the other person. Like many other skills necessary for providing a health care service, the skill of listening requires conscious effort and constant practice. Listening skills can be improved and enhanced by developing the following attitudes and skills:

- Want to listen
- Develop your interests and knowledge
- Look at the content of the message
- Hear the speaker out
- Focus on ideas
- Remove or adjust distractions
- Maintain objectivity
- Concentrate on the immediate interaction

As a health care provider, you will be using the communication process to service a consumer's needs. Briefly these needs can be classified as either short-term or long-term. To simplify this discussion, short-term needs of communication will be discussed under the heading of "CONTACT POINT." Long-term needs will be discussed under the heading of "THERAPEUTIC COMMUNICATIONS."

CONTACT POINT

To provide you with a frame of reference for the following discussion, the following definitions will clarify and standardize some critical terms.

- Initial contact point—a physical location where the consumer experiences his or her first communication encounter with a person representing, in some role, the health care facility

- Contact point—the place or event where the contact point person and the consumer meet. The contact point meeting can occur anywhere in a facility and also includes telephone events

- Contact point person—the health care provider in any health care experience who is tasked by role and responsibility to provide a service to the consumer.

The contact point person has certain criteria to meet in establishing a good relationship with the patient. Helping the patient through trying experiences is partially the responsibility of all contact point personnel. Such health care providers must not only have skills related to their professional assignment, but they must also have the ability to interact in a positive, meaningful way to communicate concern and the desire to provide a service.

Consumers of health care services expect to be treated promptly, courteously, and correctly. They expect their care to be personalized and communicated to them in terms that they understand. The Navy health care system is a service system, and it is the responsibility of every health care provider to improve the professional nature of the system.

The significance of the contact point and the responsibility of the personnel staffing these areas are important to emphasize. The following message from a former Surgeon General of the Navy reflects the philosophy of the Navy Medical Department regarding contact point interactions.

> "Some of the most frequent complaints received by the Bureau of Medicine and Surgery are those pertaining to the lack of courtesy, tact, and sympathetic regard for patients and their families exhibited by Medical Department personnel at initial points of contact, within Navy facilities. These points of initial patient contact, which include central appointment desks, telephones, patient affairs offices, emergency rooms, pharmacies, laboratories, record offices, information desks, walk-in and specialty clinics, and gate guards, are critical in conveying to the entering patient the sense that Navy medicine is there to help them. The personnel, both military and civilian, who man these critical areas are responsible for ensuring that the assistance that they provide is truly reflective of the spirit of "caring" for which the Navy Medical Department must stand.
>
> No matter how excellent and expert the care in the facility may be, an early impression of nonchalance, disregard, rudeness, or neglect of the needs of patients reflects poorly on its efforts and achievements. Our personnel must be constantly on their guard to refrain from off-handed remarks or jokes in the presence of patients or their families. We must insist that our personnel in all patient areas are professional in their attitudes. What may be commonplace to us may be to a patient frightening or subject to misinterpretation. By example and precept, we must insist that, in dealing with our beneficiaries, no complaint is ever too trivial not to deserve the best response of which we are capable. . . ."

192

THERAPEUTIC COMMUNICATIONS

As mentioned earlier in this chapter, a distinguishing aspect of therapeutic communication is its application to long-term communication interactions. Therapeutic communication may be defined as the face-to-face process of interacting that focuses on advancing the physical and emotional well-being of a patient. This kind of communication has three general purposes: collecting information to determine illness, assessing and modifying behavior, and providing health education. In the process of using therapeutic communication, we attempt to learn as much as we can about the patient in relation to the illness. To accomplish this, both the sender and the receiver must be consciously aware of the confidentiality of the information disclosed and received during this process. The health care provider must always have a therapeutic reason for invading the patient's privacy.

When used to collect information, therapeutic communication requires a great deal of sensitivity and expertise in using interviewing skills. To ensure the identification and clarification of thoughts and feelings, the interview process must include observing behavior, listening, giving and receiving verbal and nonverbal responses, and interpreting and recording data.

Observation of behavior is simply the recognition of any sign the body makes when responding to a need. The quivering, excited tone of voice you hear when a mother rushes into the emergency room after her child has swallowed bleach is communicating fear and anxiety.

Listening is probably one of the most difficult skills to master. It requires the health care provider to maintain an open mind, eliminate both internal and external noise and distractions, and channel attention to all verbal and nonverbal messages. Listening involves the ability to recognize pitch and tone of voice, evaluate vocabulary and choice of words, and recognize hesitancy or intensity of speech as part of the total communication attempt. The patient crying aloud for help after a fall is communicating a need for assistance which is different from the way you might sound in communicating a need for assistance in requesting help to transcribe a physician's order.

The ability to recognize and interpret nonverbal responses depends upon consistent development of observation skills. As you continue to mature in your role and responsibilities as a member of the health care team, both your clinical knowledge and understanding of human behavior will also grow. Your growth in both knowledge and understanding will contribute to your ability to recognize and interpret many kinds of nonverbal communication. Your sensitivity in listening with your eyes will become as refined as, if not better than, listening with your ears.

The effectiveness of an interview is influenced by both the amount of information and degree of motivation possessed by the consumer (interviewee). Factors that enhance the quality of an interview consist of the participant's knowledge of the subject under consideration, their patience, temperament, listening skills, and attention to both verbal and nonverbal cues. Courtesy, understanding, and nonjudgmental attitudes must be mutual goals of both the interviewee and the interviewer. Finally, the health care provider must be an informed and skilled practitioner to function effectively in the therapeutic communication process. This kind of provider development requires an individual's commitment to consistently seek out and participate in a variety of continuing education learning experiences related to the entire spectrum of health care services.

ASSESSING AND REPORTING

Although the physician determines the overall medical management of the person requiring health care services, he or she depends upon the asssistance of other members of the health care team in implementing and evaluating the patient's ongoing treatment. Nurses and Hospital Corps personnel spend more time with the hospitalized patient that all other providers. This places them in a key position as data collecting and reporting resource persons.

The systematic gathering of information is called data collection and is an essential aspect in assessing an individual's health status, identifying existing problems and developing a combined plan of action to assist the patient in his or her health needs. The initial assessment is usually accomplished by establishing a health history. Included in this history are elements such as previous and current health problems; patterns of daily living activities, medication and dietary requirements; and other relevant occupational, social, and psychological data. Additionally, both subjective and objective observations are included in both the initial assessment gathering interview and throughout the course of hospitalization.

Subjective observations, which include symptoms, consist of the verbal information given to the provider by the patient or a significant other person. These include such things as a description of pain or discomfort, the presence of nausea or dizziness, and a multitude of other descriptions of dysfunction, discomfort, or illness.

Objective observations, which can also include symptoms, are those that can be actually seen, heard, touched, felt, or smelled by the health care provider. Included in objective observations are measurements such as temperature, pulse, respiration, skin color, swelling, and even the results of tests.

Intelligent assessments are the results of accurate observations that require a combination of theoretical insight and perfected skills, both of which require a constant effort towards professional development in the provider. Accurate and intelligent assessments are the basis of good patient care and are essential elements for providing a total health care service. As such, Hospital Corps personnel must know what to watch for and what to expect. It is important to be able to recognize even the slightest change in a patient's condition, since this may indicate a definite improvement or deterioration. Health care providers must be able to recognize the desired effects of medications and treatments, as well as undesirable reactions to them. Both of these factors may influence the physician's decision to continue, modify, or discontinue parts or all of the treatment plan.

Equally as important as assessments is the reporting of these data to appropriate team members. Reporting consists of both vocal and written communications and to be effective must be done accurately, completely, and in a timely manner. Written reporting, commonly called recording, is documented in the patient's record. Maintaining an accurate, descriptive clinical record serves a dual purpose. It provides a written report of the information gathered about the patient and serves as a means of communciation to all those involved in the patient's care. The record also serves as a valuable source of information for the development of a variety of care planning activities. Additionally, the clinical record is a legal document and is admissible as evidence in a court of law in claims of negligence and malpractice. Finally, these records serve as an important source of material that can be used for educating and training health care personnel, and for compiling research and statistical data.

It is imperative that the health care provider follows some basic guidelines when making written entries in the record. All entries must be recorded accurately and truthfully. The omission of an entry is as inaccurate as an incorrect recording. Each entry should be concise and brief; therefore, extra words and vague notations are to be avoided. Recordings must be legible; if an error is made, it must be deleted following the standard Navy policy for correcting erroneous written notations. Lastly, all health care providers making entries in the clinical record must indicate the time and date and sign their name and rate or rank.

The following self-questioning technique is a good guide to assist you in developing proficiency in assessing and reporting patient's conditions.

- General appearance:
  - Is the patient
    - of average build, short, tall, thin, or obese?
    - well-groomed?
    - apparently in pain?
    - walking with a limp, wearing a cast, walking on crutches, or have a prosthetic extremity?

- Behavior:
    - Does the patient
        - appear worried, nervous, excited, depressed, angry, oriented, confused, or unconscious?
        - refuse to talk?
        - connect thoughts appropriately?
        - lisp, stutter, or have slurred speech?
        - appear sullen, bored, aggressive, friendly, or cooperative?
        - sleep well or arouse easily?
        - sleep poorly, moan, talk, or cry out when sleeping?
        - join in ward activities?
        - react well toward other patients, staff, and visitors?
- Position:
    - Does the patient
        - remain in one position in bed?
        - have difficulty breathing while in any position?
        - use just one pillow or require more to sleep well?
        - move about in bed without difficulty?
- Skin:
    - Is the patient's skin
        - flushed, pale, cyanotic, hot, moist, clammy, cool, or dry?
        - bruised, scarred, lacerated, scratched, or showing a rash, lumps, or ulcerations?
        - showing signs of pressure, redness, mottling, edema, or pitting edema?
        - appearing shiny or stretched?
        - perspiring profusely?
        - infested with lice?
- Eyes:
    - Are the eyelids swollen, bruised, discolored, or drooping?
    - Is the sclera clear, dull, yellow, or bloodshot?
    - Are the pupils constricted or dilated; are they equal in size; do they react equally to light?
    - Does the patient complain about pain, burning, itching, sensitivity to light, or blurred, double, or lack of vision?
    - Are the eyes tearing or showing signs of inflammation or discharge?
- Ears:
    - Does the patient
        - hear well bilaterally?
        - hold or pull on his or her ears?
        - complain of a buzzing or ringing sound?
        - have a discharge or wax accumulation?
        - complain of pain?
- Nose:
    - Is the nose bruised, bleeding, or difficult to breathe through?
    - Is it excessively dry or dripping?
    - Are both nares equal in size?
    - Does the patient sniff excessively?

- Mouth:
    - Is the mouth excessively dry?
    - Does the breath smell sweet, sour, or alcoholic?
    - Does the tongue appear dry, moist, clean, coated, cracked, red, or swollen?
    - Are the gums inflamed, ulcerated, swollen, or discolored?
    - Are the teeth white, discolored, broken, or absent?
    - Does the patient
        - wear dentures, braces, or partial plates?
        - complain of mouth pain or ulcerations?
        - complain of an unpleasant taste?
- Chest:
    - Does the patient have shortness of breath, wheezing, gasping, or noisy respirations?
    - Does he or she cough?
    - If coughing, is it dry, moist, hacking, productive, deep, or persistent?
    - Is the sputum white, yellow, rusty, or bloody?
        - Is it thin and watery, or thick and purulent?
        - How much is produced?
        - Does it have an odor?
    - Does patient complain of chest pain?
        - Where is the pain?
        - Is the pain a dull ache, sharp, crushing, radiating?
        - Is pain relieved by resting?
        - Is patient using medication to control the pain? (i.e.: Nitroglycerine)
- Abdomen:
    - Does the abdomen look or feel distended, board-like, or soft?
    - If distended, is the distension above or below the umbilicus or over the entire abdomen?
    - Does the patient belch excessively?
    - Is the patient nauseated or vomiting?
        - If so, how often and when?
        - What is the volume, consistency, and odor of the vomitus?
        - Is it coffee ground, bilious, or bloody in appearance?
        - Is it projectile?
- Bladder and Bowel:
    - Is the patient incontinent of urine or stool?
    - What is the volume and frequency of urination?
        - Does the urine have an odor?
        - Is it dark amber or bloody?
        - Is it cloudy; does it have sediment in it?
        - Is there pain, burning, or difficulty when voiding?
    - Does the patient have diarrhea, soft stools, or constipation?
        - What is the color of the stool?
        - Does it contain blood, pus, fat, or worms?
        - Does the patient have hemorrhoids, fistulas, or rectal pain?

- Vagina or Penis:
  - Are there ulcerations or irritation?
  - Is there a discharge or foul odor?
    - If there is a discharge present, is it bloody, purulent, mucoid, or watery? What is the amount?
  - Is there associated pain?
    - If pain is present, where is it located?
    - Is it constant or intermittent?
    - Is it tingling, dull, aching, burning, gnawing, cramping, or crushing?
- Food and Fluid Intake:
  - Is the patient's appetite good, fair, or poor?
  - Does the patient get thirsty often?
  - Does the patient have any kind of food intolerance?
- Medications:
  - Is patient presently taking any medications?
  - If so, what, why, when last taken?
  - Does patient have medications with him/her?
  - Does patient have any history of medication reactions, allergies?

HEALTH EDUCATION

As mentioned earlier in this chapter, patient education (health education) is an essential part of the health care delivery system. In the Navy Medical Department, patient education is defined as "the process that informs, motivates, and helps people to adapt and maintain healthful practices and life styles." Specifically, the goals of this process are:

- To assist individuals to acquire knowledge and skills that will promote their ability to care for themselves more adequately
- To influence individual attitudinal changes from a disease to a health orientation
- To support behavioral changes to the extent that individuals are willing and able to maintain their health

All health care providers, whether they recognize it or not, are teaching almost constantly. Teaching is a unique skill that is developed through the application of principles of learning. Patient teaching begins with an assessment of the patient's knowledge. Through this assessment, learning needs are identified. For example a diabetic patient may have a need to learn how to self administer an injection. After the learner's needs have been established, goals and objectives are developed. Objectives inform the learner of what kind of (learned) behavior is expected. Objectives also assist the health care provider in determining how effective the teaching has been. These basic principles of teaching/learning are applicable to all patient education activities, from the simple procedure of teaching a patient how to measure and record his or her fluid intake/output, to the more complex programs of behavior modification in situations of substance abuse (i.e., drug, alcohol).

As a member of the health care team, you share a responsibility with all other members of the team to be alert to patient education needs, to undertake patient teaching within the limitations of your own knowledge and skills, and to communicate to other team members the need for patient education in areas you are not personally qualified to undertake.

PROFESSIONAL PRACTICE

Each member of the health care team has certain responsibilities and limitations that define their area of practice. To fulfill your role as a member of the Hospital Corps within the context of the total mission of the Navy Medical Department, it is imperative that your practice be based on a sound body of knowledge and the development of well-defined technical skills. The rate training manuals are one mechanism that contribute to the development of your body of knowledge. The occupational standards define minimal technical skills required of Hospital Corps personnel at various levels in their career. Other members of the health care team through the mechanism of on-the-job training, inservice classes, and continuing education programs contribute significantly to your continued growth in both health care knowledge and skills.

In conjunction with their professional responsibilities, all health care providers must realize that they are subject to certain limitations in providing health care services. These limitations are based on amount and kind of education, training, experience and local regulations and guidelines. It is the mature, responsible individual who recognizes, accepts, and demands that these limitations be respected. In the clinical settings, Hospital Corps personnel are tasked with administering medications, performing treatments, and providing individual patient care in compliance with a physician's orders. In the hospital and some clinic environments, a Nurse Corps officer divides and delegates portions of the patient's care to other members of the team based on the skills and experience of each. In situations where a Nurse Corps officer is not a member of the team, such delegation of duties will generally be made by a senior and experienced petty officer of the Hospital Corps.

Regardless of rank, rate, or corps membership, all members of the health care team are held accountable for their performance. Accountable means to be held answerable. As a health care provider, you must continue to acquire new knowledge and skills and strive for professional proficiency. Equally important is your ability to apply new knowledge and acquired skills as a helping professional in providing total health care.

Accountability becomes a critical issue when determining incidents of malpractice. Malpractice occurs when an individual delivers improper care due to negligence or practicing outside his or her area of expertise. Because the areas of expertise and responsibility in medicine are frequently overlapping, legal limits of practice are defined by each State. The assignments and responsibilities of hospital corpsmen frequently include areas of practice usually provided by physicians and nurses in the civilian sector. These responsibilities are only legal when Hospital Corps personnel are performing such duties while under the authority of the U.S. Government. Because of this, it is vital that you thoroughly understand your legal rights and limitations when providing patient care services both in government and civilian sectors.

Another area that has potential medicolegal implications regarding your role as a health care provider consists of giving advice or opinions. As a result of your frequent and close contact with patients, you will often be asked your opinion of the care or the proposed care a patient is undergoing. For the most part, these questions are extremely difficult to respond to regardless of who the health care provider is. No one is ever totally prepared or has so much wisdom that they can respond spontaneously in such situations. In such cases it is best to refer the question to the nurse or physician responsible for the patient's care.

You must always be conscious that you are seen as a representative of Navy medicine by the recipients of your care. As such, you will be accorded the respect that goes with having a specialized body of knowledge and an inventory of unique skills. A caduceus on the sleeve of the hospital corpsman marks that person as a member of a prestigious corps worthy of respect. How one responds to this respect will quickly determine whether the individual will continue to earn it.

Remember, you have been charged to provide care to a total, feeling, human person. The person seeking health care service has the same needs for security, safety, love, respect, and self-fulfillment as everyone else. When something threatens the soundness of the body, mind, or spirit, an individual frequently behaves inappropriately. Occasionally there are temper outbursts, episodes of pouting, sarcastic remarks, unreasonable demands, or other inappropriate responses, often to the point of disruptive behavior. The health care provider is challenged to look beyond the behavior being displayed to identify the underlying stress and to attempt to relieve the immediate and obvious source of anxiety. This is as simple as communicating, through your care and understanding of the patient as an individual, that Navy medicine is pleased to provide a caring service.

SAFETY ASPECTS

In the introductory section of this chapter, we established the primary goal of the health care provider as maintaining, sustaining, restoring, and rehabilitating a physical or psychological function of the consumer. To achieve this goal, health care facilities and providers are charged with developing policies and implementing mechanisms that ensure safe, efficient, and therapeutically effective care. The theme of this discussion is safety and will address the major aspects of both environmental and personal safety.

ENVIRONMENTAL SAFETY

For purposes of this discussion, the environment is defined as the physical surroundings of the patient and includes such things as lighting, equipment, supplies, chemicals, architectural structure, and the ever present accident potential activities of both patient and staff personnel. Maintaining safety becomes even more difficult when working with people who are ill or anxious and cannot exercise their usual control over the environment. Loss of strength, decreased sensory input, and disability often accompany illness. Because of this, the health care provider must be constantly alert and responsive to maintaining a safe environment.

Both JCAH and the National Safety Council of the American Hospital Association (AHA) have identified four major types of accidents that continually occur to patients. These hazards consist of falls, electrical shocks, physical and chemical burns, fires, and explosions. The most basic of hospital equipment, the patient's bed, is a common cause of falls. Falls occur among oriented patients getting in and out of bed at night in situations where there is inadequate lighting. Falls occur among disoriented or confused bed patients when bed rails are not used or used improperly. Slippery or cluttered floors contribute to patient, staff, and even visitor falls. Patients with physical limitations or those being treated with sensory altering medications fall when attempting to ambulate without proper assistance. Falls result from running in passageways, carelessness when going around blind corners, and personnel and equipment collisions. Unattended and improperly secured patients fall from gurneys and wheelchairs.

Health care personnel can do much to prevent the incidence of falls by following some simple procedures, such as properly using side rails on beds, gurneys, and cribs; and locking the wheels of gurneys and wheelchairs when transferring a patient or leaving one unattended. Safety straps must also be used to secure patients on gurneys as well as those in wheelchairs. Maintaining dry and uncluttered floors markedly reduces the number of accidental falls. Patients with physical or sensory deficiencies should always be assisted during ambulation. Those using crutches, canes, or walkers must receive adequate instructions in ambulating with the aids before being permitted to ambulate independently. The total care environment must be equipped with adequate night lights to assist orientation and to prevent falls resulting from an inability to see potential hazards.

The expanded variety, quantity, and complexity of electrical and electronic equipment used for diagnostic and therapeutic care has markedly increased the hazards of burns, shock, explosions, and fire. It is imperative that health care providers at all levels be alert to such hazards and exert a continued effort to maintain an electrically safe environment. Knowledge and adherence to the following guidelines will contribute markedly to providing an electrically safe environment for all personnel whether they be patients, staff, or visitors.

- Do not use electrical equipment with damaged plugs or cords.
- Do not attempt to repair defective equipment.
- Do not use electrical equipment unless it is properly grounded with a three-wire cord and three-prong plug.
- Do not use extension cords or plug adapters unless approved by medical repair or the safety officer.
- Do not create a trip hazard by passing electrical cords across doorways or walkways.
- Do not remove a plug from the receptacle by gripping the cord.
- Do not allow the use of personal electrical appliances without approval of the safety officer.
- Do not put water on an electrical fire.
- Do not work with electrical equipment with wet hands or feet.
- Do have newly purchased electronic medical equipment tested for electrical safety by medical repair before putting it into service.
- Do operate all electrical equipment according to manufacturer's instructions.
- Do remove from service electrical equipment that sparks, smokes, or gives a slight shock. Tag defective equipment and expedite repair.
- Do be aware that patients with IVs, and electronic monitoring equipment are at high risk from minor electrical shocks.
- Do call medical repair when equipment is not functioning properly or public works if there is difficulty with the power distribution system.

Since accidents resulting in physical and chemical burns have initiated numerous consumer claims of health care provider and facility malpractice, all health care personnel must be thoroughly indoctrinated in the proper use of potential hazardous equipment, supplies, and chemicals.

The following discussion will address common causes and precautions to be taken to eliminate the occurrence of injurious burns. Additional information regarding the equipment and specific procedure for it's use will be found in the *Nursing Procedures Manual,* NAVMED P-5066.

- Hot water bottles—a common cause of burns particularly in the elderly, diabetics, and patients with circulatory impairments. When filling the bottle, the water temperature must never exceed 125 °F (51 °C). The bottle should be tested for leaks and covered so that there is a protective layer of cloth between the patient and the bottle itself.
- Heating pads—these appliances create a dual hazard of potential burns and electrical shock. The precautions taken when using heating pads are the same ones used for hot water bottles in relation to the kind of patient, temperature control, and protective cloth padding. Precautions to avoid shock consist of proper preventive maintenance of the equipment, preuse inspections and testing of the equipment for wiring and plug defects, and ensuring that periodic safety inspections are conducted by medical repair personnel.
- Ice bags—like hot water bottles, ice bags can cause skin contact burns. This kind of burn is commonly referred to as local frostbite. The precautions taken for applying ice bags are the same as those for hot water bottles in regard to attention to elderly, diabetic, and circulatory impaired patients.
- Hypothermia blankets—like ice bags, this mode of therapy can also cause areas of contact burns. When using hypothermia blankets the patient's skin must be checked frequently for signs of marked discoloration, indicating

indirect localized tissue damage. Ensure that the bare blanket does not come in direct contact with the patient's unprotected skin. This is easily accomplished by using sheets or cotton blankets between the patient and the hypothermia blanket itself. When using this form of therapy, both the physician's orders and the manufacturer's instructions must be followed in managing the temperature control of the equipment.

- Heat cradles—when using this equipment, protect the patient from burns resulting from overexposure or placement of the equipment too close to the area of the patient being treated. As with heating pads, heat cradles create a dual hazard such as potential burn and electrical shock. Another hazard to keep in mind is that of fire. Ensure that the bedding and the heat source do not come in direct contact and cause the bedding to ignite. Occasionally heat lamps will be used to accomplish the same results as a heat cradle. Towels, pillow cases, or linen of any kind should not be used to drape over heat lamps. In fact, no lamps of any kind should be draped with any kind of material, regardless of what purpose the draping is intended to accomplish.

- Steam vaporizers, hot foods, and liquids—these are common causes of patient burns. When using steam vaporizers, ensure that the vapor of steam does not flow directly on the patient as a result of the initial positioning of the equipment or by accidental movement or bumping. Patients may be more sensitive to hot foods and liquids and more likely burned. Also due to lack of coordination, weakness, or medications, patients may be less able to handle hot foods and liquids safely without spilling.

In the direct patient care units as well as in diagnostic and treatment areas, there are unlimited potentials for inflicting burns on patients. Modern electrical and electronic equipment and potent chemicals used for diagnosis and treatment when used properly contribute to the patient's recovery and rehabilitation. These same sources when used carelessly or improperly only cause the patient additional pain and discomfort, serious illness, and, in some cases, even death.

Often when we speak of safety measures, one of our first thoughts is of a fire or an explosion involving the loss of life or injury to a number of people. Good housekeeping, maintenance, and discipline help to prevent such mishaps. Remember that buildings that are constructed of fire-resistant materials are not fireproof, and certainly not explosion proof. Good maintenance includes checking, reporting, ensuring correct repair of electrical equipment, and routine checking of fire fighting equipment by qualified personnel. The education and training of personnel are the most effective means of preventing fires. Used in the context of fire safety measures, good discipline means having a plan to use as outlined in a Fire Bill, having periodic fire drills, and enforcing no-smoking regulations.

Staff members should be familiar with the fire regulations at their duty station and know what to do in case of fire. This includes how to report a fire, use a fire extinguisher, and evacuate patients. When a fire occurs, there are certain basic rules to follow: someone must take charge, remain calm, and notify the fire department and the officer of the day, giving the exact location of the fire. All oxygen equipment and electrical appliances must be turned off unless necessary to sustain life. All windows and doors should be closed and all possible exits clear. All patients must be removed in a calm and orderly fashion, and mustered.

Careless handling of cigarettes is one of the most frequent causes of serious and often fatal accidents. Cigarettes and matches must be removed from the bedside or placed out of reach of the incompetent or irrational patient. Regulations should specify areas and times when smoking is permitted. Patients, visitors, and staff must be informed of the facility's smoking regulations. To be an effective safety measure, these regulations must be enforced by all staff personnel. Smoking stands and ashtrays should be provided only in areas where smoking is permitted. Metal wastebaskets must be used throughout the hospital. They should NEVER be placed under the bed or used for cigarette disposal. "NO SMOKING" signs should be visibly displayed in rooms and areas where oxygen and flammable agents are used or stored. In addition to the posting of NO SMOKING signs, ALL staff must impress upon the patient and visitors the life threatening dangers of disobeying or ignoring smoking regulations.

GENERAL SAFETY GUIDELINES

In addition to the specifics already presented above, there are some basic principles that are relevant to patient safety. The following concepts should direct the actions of the provider in any health care service environment.

- Familiarity with the environment makes it less hazardous to the individual

- An individual's body senses inform him or her about the nature of the environment

- Age and illness affect an individual's ability to perceive and interpret sensory stimuli from the environment

- All diagnostic and therapeutic measures have the potential to cause a patient harm

- Documenting and analyzing all accidents and incidents is necessary to identify and correct high risk safety hazards

ENVIRONMENTAL HYGIENE

Today's public is very much aware of the environment and its effect on the health and comfort of human beings. The health care setting is a unique environment and has a distinct character of its own. Because of this, the health care provider must be aware of that character and ensure that the environment is one that will support the optimum in health maintenance, care, and rehabilitation.

HYGIENE

In the context of the environment, hygiene may best be described as those practices that are conducive to providing a healthy environment. Basically this includes the following three areas of concern: safety (which has already been addressed), environmental comfort and stimuli, and finally infection control (which will be discussed under "Pathogenic Organism Control"). The health care provider has certain responsibilities to control the facility's general environment as well as the patient's immediate surroundings.

Maintaining cleanliness, which also impacts on infection control, is a major responsibility of all members of the health care team, regardless of their position on the team. As a provider, the hospital corpsman, who has the most direct and frequent contact with the patient, becomes very familiar with concurrent and terminal cleaning. Concurrent cleaning ensures that the patient's individual unit is kept neat and clean during hospitalization. Terminal cleaning is performed when the patient is discharged from the unit or hospital. Both concurrent and terminal cleaning are extremely important procedures that not only aid the patient's comfort and psychological outlook but also contribute to both efficient physical care and control of the complications of illness and injury.

Aesthetically an uncluttered look is far more appealing to the eye than an untidy one. Other environmental factors such as color and noise can also enhance or hinder the progress of a person's physical condition. At one time almost all health care facilities used white as a basic color for walls and even bedside unit equipment. Research has shown that the use of color is quieting and restful to the patient, and rest is a very important healing agent in any kind of illness. Noise control is another environmental aspect that requires the health care provider's constant attention. The usual number of people and equipment traffic in a facility creates a high noise level and must be monitored. Add to that the noise of multiple radios and TVs, and it is understandable why noise control is necessary if a healing environment is to be created and maintained.

Another important aspect of environmental hygiene is climate control. Many facilities use air-conditioning or similar control systems to maintain proper ventilation, humidity, and temperature control. In facilities without air-conditioning, windows should be opened from the top and bottom to provide for cross ventilation. Ensure that the patient is not located in a draft area. Windowsill deflectors or patient screens are often used to redirect drafty air flows. Facility temperatures should be maintained at recommended energy conservation levels that are also acceptable as health promoting temperatures. In addition to maintaining a healthy climate, good ventilation is necessary in controlling and eliminating disagreeable odors. In cases where airflow does not control odors, room fresheners should be discreetly used. Odor offending articles such as soiled dressings, used bedpans, and urinals should be removed to appropriate disposal and disinfecting areas as rapidly as possible. Objectional odors such as bad breath or perspiration are best controlled by proper personal hygiene and clean clothing.

Natural light is important in the care of the sick. Sunlight usually brightens the area and helps to improve the mental well-being of the patient. However, light can be a source of irritation if it shines directly in the patient's eyes or produces a glare from the furniture, linen, or walls. Shades or blinds should be adjusted for the patient's comfort. Artificial light should be strong enough to prevent eyestrain and diffuse enough to prevent glare. Whenever possible a bedlamp should be provided for the patient. As discussed under "Safety Aspects," a dim light is valuable as a comfort and safety measure at night. It should be situated so it will not shine in the patient's eyes and yet provide sufficient light along the floor so that all obstructions can be seen. A night light may help orient elderly patients if they are confused as to their surroundings upon awakening.

In conclusion, it is important that the health care provider understand the effects of the environment on the patient. Most persons are more sensitive to excessive stimuli in the environment when they are ill and often become irritable and unable to cooperate in their care because of these excesses. This is because their body is already under stress due to their illness and does not have the energy to cope with added stimuli. This is particularly apparent in critical care (CCUs ICUs), isolation, terminal, and geriatric units. It is important that all health care providers realize and respond to the vital importance of the environment in the total medical management plan of each patient.

PATHOGENIC ORGANISM CONTROL

All health care, regardless of who provides it or where it is provided, must be directed towards maintaining, promoting, and restoring health. Because of this, all persons seeking assistance in a health care facility must be protected from additional injury, disease, or infection. Adherence to the principles and practices of safety aspects protects a patient from personal injury. Additionally, attention to personal and environmental hygiene not only protects against further injury but also constitutes the first step in controlling the presence, growth, and spread of pathogenic organisms. Some of the basic concepts of personal hygiene and communicable disease control are addressed in the "Preventive Medicine" chapter of this manual. Additional information concerning patient related personal hygiene will be found integrated throughout various sections of this chapter. The discussion that follows addresses infection control particularly in the context of medical and surgical aseptic practices.

MEDICAL ASEPSIS

Medical asepsis is the term used to describe those practices used to prevent the transfer of pathogenic organisms from person to person, place to place, or person to place. Medical aseptic practices are routinely used in direct patient care areas as well as in other service areas in the health care environment to interrupt a chain of events necessary for the continuation of an infectious process. The components of this chain of events consists of the following:

- INFECTIOUS AGENT. An organism capable of producing an infection or infectious disease.
- RESERVOIR OF INFECTIOUS AGENTS. A carrier on which an infectious

agent depends primarily for survival. The agent lives, multiplies, and reproduces so that it can be transferred to a susceptible host. Reservoirs of infectious agents are man, animals, plants, soil, or organic matter. Man himself is the most frequent reservoir of infectious agents pathogenic to man.

- PORTAL OF EXIT. The avenue by which the infectious agent leaves it's reservoir. These avenues include various body systems, such as respiratory, intestinal, and genitourinary tract, and open lessions when the reservoir is a human.

- MODE OF TRANSMISSION. The mechanism by which the infectious agent is transmitted from its reservoir to a susceptible human being (host). Air, water, food, dust, dirt, insects, inanimate objects, and other persons are examples of modes of transmission.

- PORTAL OF ENTRY. The avenue by which the infectious agent enters the susceptible host. In the human being these correspond to the exit route avenues, including the respiratory and gastrointestinal tract, and through a break in the skin or direct infection of the mucous membrane.

- SUSCEPTIBLE HOST. A human being or other living organism which afford an infectious agent nourishment or protection to survive and multiply.

Removal or control of any one component in the above chain of events will control the infectious process.

Two basic medical asepsis practices are handwashing and linen handling procedures. Frequent handwashing and proper linen handling are absolutely essential practices for preventing and controlling the spread of infection and transmittable diseases. The following are some common instances when provider handwashing is necessary:

- Before and after each patient contact
- Before handling food and medications
- After coughing, sneezing, or blowing your nose
- After using the toilet

Improper handling of linen results in the transfer of pathogenic organisms through direct contact with the health care provider's clothing and subsequent contact with the patient, patient care items, or other materials in the care environment. Proper linen handling is such an elementary procedure that, in theory, it seems almost unnecessary to mention; however, it is a procedure so frequently and carelessly ignored that emphasis is justified. All linen, whether clean or used, must never be held against one's clothing or placed on the floor. The floors of a health care facility are considered grossly contaminated and as such any article coming in contact with the floor is also contaminated. All dirty linen must be placed in appropriate laundry bags. Linen from patients having infectious or communicable diseases must be handled in a special manner. Such procedures are discussed in the *Nursing Procedures Manual,* NAVMED P-5066, under the section "Isolation Procedures."

Isolation technique, a medical aseptic practice, inhibits the spread and transfer of pathogenic organisms by limiting the contacts of the patient and creating some kind of physical barrier between the patient and others. In isolation techniques, disinfection procedures are employed to control contaminated items and areas. For purposes of this discussion, disinfection is described as the killing of certain infectious (pathogenic) agents outside the body by a physical or chemical means. Isolation techniques employ two kinds of disinfection practices, concurrent and terminal. Concurrent disinfection consists of the daily measures taken to control the spread of pathogenic organisms while the patient is still considered infectious. Terminal disinfection consists of those measures taken to destroy pathogenic organisms remaining after the patient is discharged from isolation. There are a variety of chemical and physical means used to disinfect supplies, equipment, and environmental areas, and each facility will determine their own protocols based on recommendations of an Infection Control Committee.

SURGICAL ASEPTIC TECHNIQUE

As used in this discussion, surgical aseptic technique is the term used to describe the sterilization, storage, and handling of articles to keep them free of pathogenic organisms. The following discussion will address the preparation and sterilization of surgical equipment and supplies, and the preparation of the operating room for performing a surgical procedure. It should be noted that specific methods of preparation will vary from place to place, but the basic principles of surgical aseptic techniques will remain the same. This discussion will present general guidelines, and individual providers are advised to refer to local instructions regarding particular routines of a specific facility.

Before an operation, it is necessary to sterilize and keep sterile all instruments, materials, and supplies that come in contact with the surgical site. Every item handled by the surgeon and his or her assistants must be sterile. The patient's skin and the hands of the members of the surgical team must be thoroughly scrubbed, prepared, and kept as aseptic as possible.

During the operation, the surgeon, surgeon's assistants, and scrub corpsman must wear sterile gowns and gloves and must not touch anything that is not sterile. Maintaining sterile technique is a cooperative responsibility of the entire surgical team. Each member must develop a surgical conscience, a willingness to supervise and to be supervised by others regarding the adherence to standards. Without this cooperative and vigilant effort, an otherwise successful surgical procedure may result in a complete failure if a break in sterile technique goes unnoticed or not corrected.

Basic Guidelines

To assist in maintaining aseptic technique, the following principles must be strictly adhered to by all members of the surgical team.

- All personnel assigned to the operating room must practice good personal hygiene. This includes daily bathing and clothing change.

- Those personnel having colds, sore throats, open sores, and other infections should not be permitted in the operating room.

- Proper operating room attire, which includes scrub suits, gowns, head coverings, and face masks, should not be worn outside the operating room suite. If such occurs, change all attire before reentering the clean area. (The operating room and adjacent supporting areas are classified as clean areas.)

- All members of the surgical team having direct contact with the surgical site must perform the surgical hand scrub before the operation.

- All materials and instruments used in contact with the site must be sterile.

- The sterile gowns worn by surgeons and scrub corpsmen are considered sterile from shoulder to waist, including the gown sleeves. Only the front of the gown is considered sterile.

- Sterile surgical gloves are considered aseptic. If they are torn, punctured, or have touched an unsterile surface or item, they are considered contaminated.

- The safest, most practical method of sterilization for most articles is steam under pressure.

- Label all prepared, packaged, and sterilized items with an expiration date.

- Use articles packaged and sterilized in cotton muslin wrappers within 28 calendar days.

- Use articles sterilized in cotton muslin wrappers and sealed in plastic within 180 calendar days.

- Non sterile articles must not come in contact with sterile articles.

- Make sure the patient's skin is as clean as possible before a surgical procedure.

- Take every precaution to prevent contamination of sterile areas or supplies by airborne organisms.

Methods of Sterilization

Sterilization refers to the complete destruction of all living organisms, including bacterial spores and viruses. The word sterile means free from or the absence of all living organisms. Any item to be sterilized must be thoroughly cleaned before sterilization. Items may be cleaned mechanically or by hand, using soap or detergent and water. When cleaning by hand, apply friction to the item by using a brush. After cleaning, thoroughly rinse the items with clean, running water before sterilization. The appropriate sterilization method is determined according to how the item will be used, the material of which the item is made, and the sterilization methods available. Physical methods of sterilization comprise moist heat and dry heat. Chemical methods include gas and liquid solutions.

Physical Methods

Moist Heat

Steam under pressure (autoclave) is the most dependable and economical method of sterilization. It is the method of choice for metalware, glassware, most rubber goods, and dry goods. All articles must be correctly wrapped or packaged so that the steam will come in contact with all surfaces of the article. Similar items should be sterilized together, especially those requiring the same time and temperature exposure. Articles that will collect water must be placed so the water will drain out of the article during the sterilization cycle. A sterilizer should be loaded in a manner that will allow the free flow of steam in and around all articles. Each item sterilized must be dated indicating the expiration of sterility. Sterilization indicators must be used in each load that is put through the sterilization process. This verifies proper steam and temperature penetration.

The operating instructions for a steam sterilizer will vary according to the type and manufacturer. There are a number of manufacturers, but there are only two types of steam under pressure sterilizers. They are the downward displacement and the prevacuum, high temperature autoclave.

In the downward (gravity) displacement autoclave, air in the chamber is forced downward and out of the bottom discharge outlet as pressurized steam enters from the top of the chamber. The temperature in the sterilizer gradually increases as the steam heats the chamber and its contents. The actual timing does not begin until the temperature is above 245°F. (118°C.).

The prevacuum high temperature autoclave is the most modern and economical to operate and requires the least time to sterilize a single load. By using a vacuum pump, air is extracted from the chamber before admitting steam. This prevacuum process permits instant steam penetration to all articles and through all cotton or linen dry goods. The sterilization time is reduced to 4 minutes. The temperature in the chamber is rapidly raised and held at 274°F (134°C). Timing the cycle is done automatically.

If the temperature is increased, the sterilization time may be decreased. The following are some practical sterilization time periods:

- 3 minutes at 270°F (132°C)
- 8 minutes at 257°F (125°C)
- 18 minutes at 245°F (118°C)

All operating rooms are equipped with high speed (flash) sterilizers. Unwrapped, uncovered, opened instruments placed in perforated trays are "flash" sterilized for 3 minutes at 270°F (132°C). Sterilization timing begins when the above temperature is reached, not before.

Dry Heat

The use of dry heat as a sterilizing agent has limitations. It should be restricted to items that are unsuitable for exposure to moist heat. High temperatures and extended time periods are required when using dry heat. In most instances, this method often proves impractical. The temperature must be 320°F (160°C), and the time period must be at least 2 hours.

Chemical Sterilization

Only one liquid chemical, if properly used, is capable of rendering an item sterile; that chemical is glutaraldehyde. The item to be sterilized must be totally submerged in the glutaraldehyde solution for 10 hours. Before immersion the item must be thoroughly cleansed and rinsed with sterile water or sterile normal saline. It should be noted that this chemical is extremely caustic to skin, mucous membranes, and other tissues.

The most effective method of chemical sterilization presently available is the use of ethylene oxide (ETO) gas. ETO gas sterilization should be used only for materials and supplies that will not withstand sterilization by steam under pressure. Never gas sterilize any item that can be steam sterilized. The concentration of the gas and the temperature and humidity inside the sterilizer are vital factors that affect the gas sterilization process.

ETO gas sterilization periods range from 3 to 7 hours. All items gas sterilized must be allowed an aeration (airing out) period. During this period, the ETO gas is expelled from the surface of the item. It is not practical here to present all exposure times, gas concentrations, and aeration times for various items to be gas sterilized. When using an ETO gas sterilizer it is important to be extremely cautious and to follow carefully the manufacturer's instructions.

Preparation of Supplies for Autoclaving

General Rules

- Ensure that all articles to be sterilized are clean and in good condition and working order.
- Wrap instruments and materials to be autoclaved in double muslin wrappers or two layers of disposable sterilization wrappers.
- When muslin wrappers are routinely used, launder them after each use and carefully inspect them for holes and tears before use.
- When articles are placed in glass or metal containers for autoclaving, place the lid of the container so the steam will penetrate the entire inside of the container.
- The contents of a linen pack are arranged in such a way so the articles on top are used first.
- Label every item that is packaged for sterilization to specify the contents and expiration date.
- Do not place surgical knife blades and suture materials inside linen packs or instrument trays before sterilization.

Instruments

- Wash each instrument after use with an antiseptic detergent solution. When washing by hand, pay particular attention to hinged parts and serrated surfaces. Rinse all instruments and dry them thoroughly.
- Use an instrument washer/sterilizer, if available, to decontaminate instruments and utensils following each surgical procedure.
- Following cleaning and decontamination, hinged instruments wrapped singly or placed in trays for resterilization are left unclamped.

Glassware

- Inspect all reusable glassware for cracks or chips.
- Wash all reusable glassware with soap or detergent and water, after use, and rinse it completely.
- When preparing reusable glass syringes:
    - Match numbers or syringe parts.
    - Wrap each plunger and barrel separately in gauze.
    - Wrap each complete syringe in a double muslin wrapper.
- When glassware, tubes, medicine glasses, and beakers, are part of a sterile tray, wrap each glass item in gauze before placing it in the tray.

Suture Materials

Suture materials are available in two major categories: absorbable and nonabsorbable. Absorbable suture materials can be digested by the tissues during the healing process. Absorbable sutures are made from collagen, an animal protein derived from healthy animals or from synthetic polymers. Nonabsorbable suture materials are those that effectively resist the enzymatic digestion process in living tissue. These sutures are made of metal or other organic materials. Each strand of both types of specifically sized suture material is uniform in diameter and physical properties and is predictable in performance.

Modern manufacturing processes make all suture materials available in individual packages, presterilized, with or without surgical needle attached. Once opened, do not resterilize either the individual package or an individual strand of suture material. The only exception to this rule involves the use of surgical stainless steel. This material is often provided in unsterile packages or tubes. Individual strands or entire packages must be sterilzed before use.

Rubber/Latex Materials

- Rubber tubing is to be washed in an antiseptic detergent solution.
- Pay attention to the inside of the tubing. Rinse all tubing well and place it flat or loosely coiled in a wrapper or container.
- When packing latex surgical drains for sterilization, place a piece of gauze in the lumen of the drain. Never resterilize surgical drains.
- Rubber catheters bearing a disposable label must never be resterilized.
- Sterile disposable surgeons (rubber) gloves are for one time use only and are never resterilized.

Handling Sterile Articles

Establishing a Sterile Field

When changing a dressing, removing sutures, or preparing the patient for a surgical procedure, it will be necessary to establish a sterile field from which to work. The field should be established on a stable, clean, flat, dry surface. Wrappers from sterile articles may be used as a sterile field as long as the inside of the wrapper remains sterile. If the size of the wrapper does not provide a sufficient working space for the sterile field, use a sterile towel. Nothing but sterile articles and supplies are placed on the field. Once established, the field is touched only by those persons who have donned sterile gloves.

Basic Rules

- An article is either sterile or unsterile. There is no in-between. If there is doubt about the sterility of an item, consider it unsterile.
- Do not open sterile articles until they are ready for use.
- Do not leave sterile articles unattended once they are opened and placed on a sterile field.
- Do not return sterile articles to a container once they are removed from the container.
- Never reach over a sterile field.
- When pouring sterile solutions into sterile containers or basins, do not touch the sterile container with the solution bottle. Once opened, bottles of liquids must be entirely used when first poured. If any liquid is left in the bottle it must be discarded.
- Never use an outdated article. Unwrap it, inspect it, and if reusable, rewrap it in a new wrapper for sterilization.

Surgical Hand Scrub, Gowning, and Gloving

The purpose of the surgical hand scrub is to reduce resident and transient skin flora (bacteria) to a minimum. Resident bacteria are often the result of organisms present in the hospital environment. Because these bacteria are firmly attached to the skin, they are difficult to remove. However, their growth is inhibited by the antiseptic action of the scrub detergent used. Transient bacteria are usually acquired by direct contact and are loosely attached to the skin. These are easily removed by the friction created by the scrubbing procedure.

Proper hand scrubbing and the wearing of sterile gloves and a sterile gown provide the patient with the best possible barrier against pathogenic bacteria in the environment and against bacteria from the surgical team.

Surgical Hand Scrub Procedure

- Before beginning the hand scrub, don a surgical cap or hood that covers all hair, both head and facial, and a disposable mask covering the nose and mouth.

- Using approximately 6 ml of antiseptic detergent and running water, lather hands and arms to 2 inches above the elbow. Leave detergent on the arms and do not rinse.

- Under running water, clean fingernails and cuticles, using a nail cleaner.

- Starting with fingertips, rinse each hand and arm by passing them through the running water. Always keep hands above the level of the elbow.

- From a sterile container, take a sterile brush and dispense approximately 6 ml of antiseptic detergent on the brush and begin scrubbing hands and arms.

  - Begin with fingertips. Bring thumb and fingertips together and using the brush scrub across fingertips using 30 strokes.

  - Now scrub all surface planes (4) of the thumb and all surfaces of each finger, including the webbed space between fingers, using 20 strokes.

  - Scrub the palm and back of the hand in a circular motion, using 20 strokes each.

  - Visually divide the forearm into two parts, lower and upper; scrub all surfaces of each division 20 strokes each, beginning at the wrist and progressing to the elbow.

  - Scrub the elbow in a circular motion using 20 strokes.

  - Scrub in a circular motion all surfaces approximately 2 inches above the elbow.

- Do not rinse this arm when you have finished scrubbing. Rinse only the brush.

- Pass the rinsed brush to the scrubbed hand and begin scrubbing the other hand and arm, using the same procedure outlined above.

- Drop the brush in the sink when you have finished.

- Rinse both hands and arms, keep hands above the level of elbows, and allow water to drain off elbows.

- When rinsing, do not touch anything with the scrubbed hands and arms.

- The total scrub procedure must include all anatomical surfaces from the fingertips to approximately 2 inches above the elbows.

- Dry hands with a sterile towel. Do not allow the towel to touch anything other than your scrubbed hands and arms.

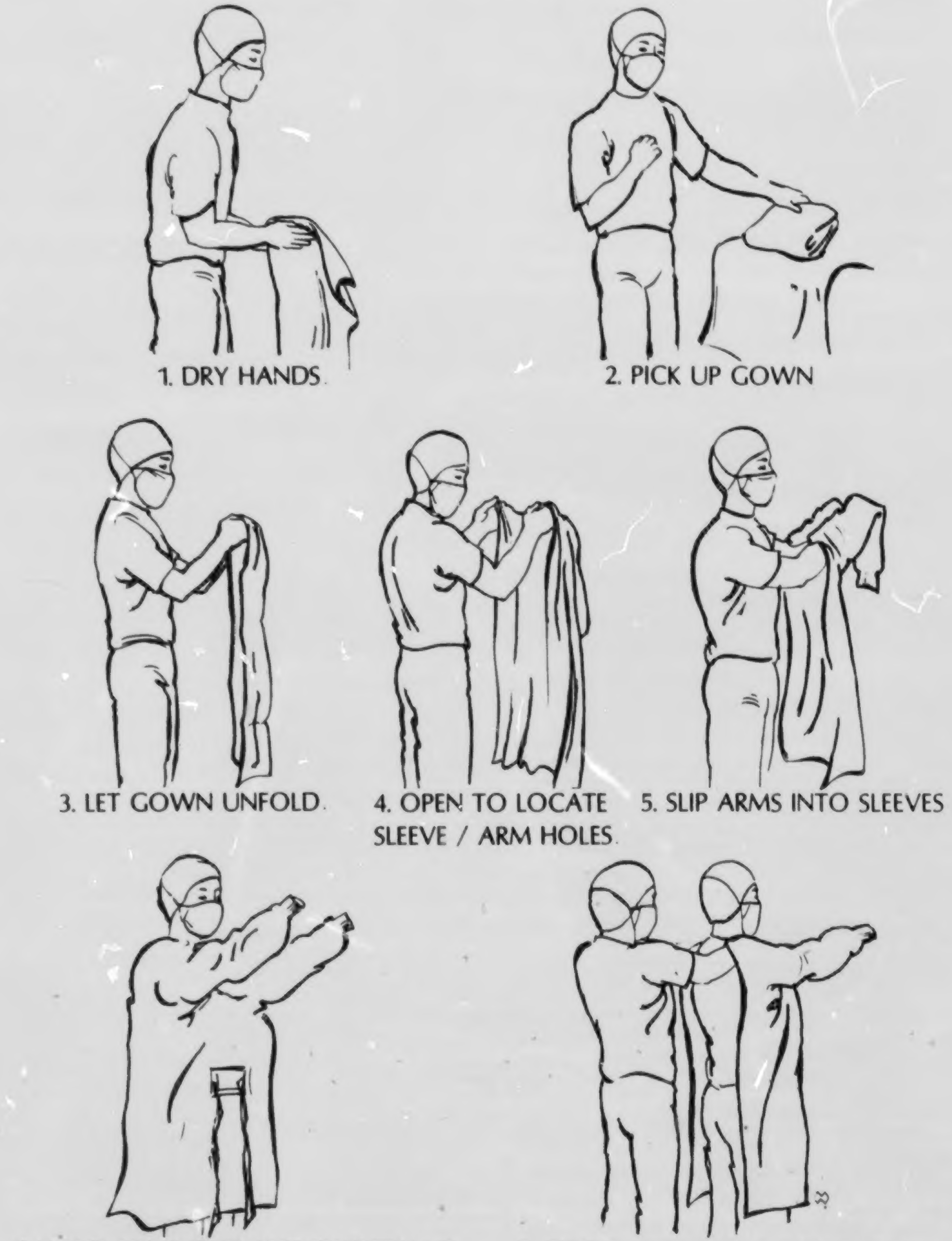
- Between operations, follow the same hand scrub procedure.

Gowning and Gloving

If you are the scrub corpsman you will have opened your sterile gown and glove packages in the operating room before beginning your hand scrub. Having completed the hand scrub, back through the door holding your hands up to avoid touching anything with the hands and arms.

- Pick up the sterile towel that has been wrapped with your gown. Touch only the towel. Refer to figure 5-1 for the proper gowning technique.

- Dry one hand and arm (hand to elbow) with one end of the towel. Dry the other hand and arm with the opposite end of the towel. Drop the towel.



1. DRY HANDS

2. PICK UP GOWN

3. LET GOWN UNFOLD

4. OPEN TO LOCATE SLEEVE / ARM HOLES

5. SLIP ARMS INTO SLEEVES

6. HOLD ARMS OUT AND SLIGHTLY UP

7. CIRCULATOR PULLS GOWN ON

154.169

Figure 5-1.—Gowning.

- Pick up the gown, in such a manner that hands touch only the inside surface at the neck and shoulder seams.

- Allow the gown to unfold downward in front of you.

- Locate the arm holes and place both hands in the sleeves, holding arms out and slightly up as you slip your arms in the sleeves. Another person (circulator), who is not scrubbed will pull your gown on as you extend your hands through the gown cuffs.

- Open the inner glove packet on the same sterile surface on which you opened up the gown. The entire gloving procedure is illustrated in figure 5-2.

- Pick up one glove by the cuff using your thumb and index finger. Touching only the cuff, pull the glove on one hand, anchoring the cuff over the thumb.

- Slip gloved fingers under the cuff of other glove. Pull the glove over fingers and the hand using a stretching side to side motion.

- Anchor the cuff on the thumb. With fingers still under the cuff, pull the cuff up and away from your hand and over the knitted cuff of the gown.

- Repeat the preceding step to finish gloving the other hand.

To gown and glove the surgeon, follow these steps:

- Pick up a gown from the sterile linen pack. Step back from the sterile field and let the gown unfold in front of you. Hold the gown at the shoulder seams with the gown sleeves facing you.

- Offer the gown to the surgeon. Once he or she has the arms in the sleeves, let go of the gown. Be careful not to touch anything but the sterile gown. The circulator will tie the gown.

- Pick up the right glove. With the thumb facing the surgeon, place your fingers and thumbs of both hands in the cuff of the glove and stretch it outward making a circle of the cuff. Offer the glove to the surgeon. Be careful that the surgeon's bare hand does not touch your gloved hands.

- Repeat the preceding step for the left glove.

Cleaning the Operating Room

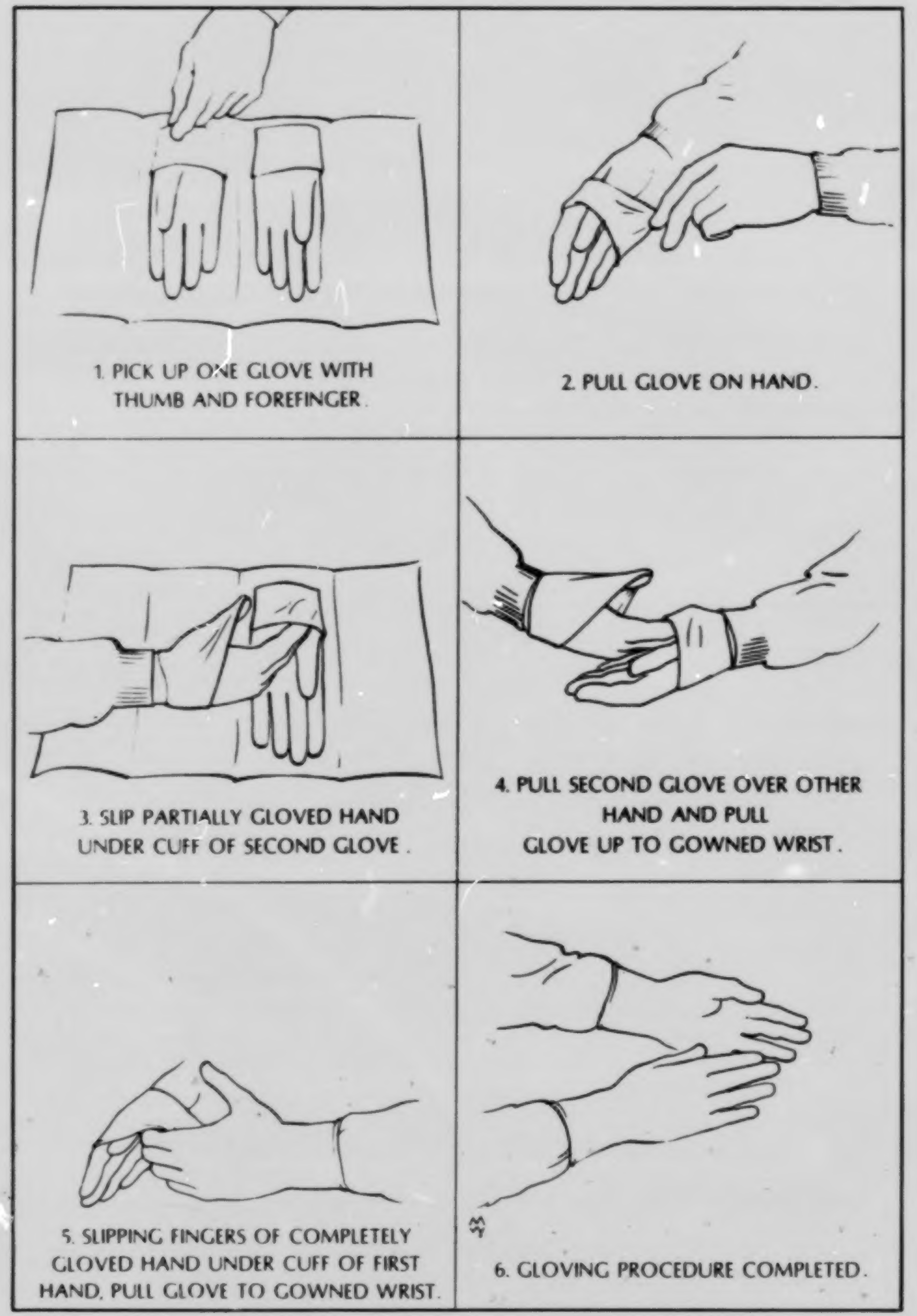
Cleanliness in the operating room is an absolute must. Cleaning routines must be clearly understood and carefully followed. The cause of postoperative wound infections have on occasion been traced to the operating room. Since no two patients are alike and all patients have their own "resident" bacteria every surgical case must be considered contaminated.

At the beginning of each day all the fixtures, equipment, and furniture in each operating room are damp dusted with an antiseptic germicide solution. During the operation, the room is kept clean and orderly at all times. Should sponges be dropped on the floor or if blood or other body fluids spill, clean the area immediately using a disinfectant germicide solution and a clean cloth. Between each operation, all items that have been used are cleaned using the wet method already mentioned. All instruments are washed by gloved hands or placed in perforated trays and put through a washer/sterilizer. The area of the floor occupied by the surgical team is cleaned, using the wet vacuum method. If a wet vacuum is not available, mops may be used if a clean mop head is used following each operation. All linens and surgical drapes are bagged and removed from the room. Gowns and gloves are removed before leaving the room. All trash and disposable items are bagged and taken from the room.

At the completion of the day's operations, each operating room should be terminally cleaned using the wet method described, with the following tasks accomplished:

- Clean all wall or ceiling mounted equipment.

- Clean all spot lights and lights on tracks.



1. PICK UP ONE GLOVE WITH THUMB AND FOREFINGER.

2. PULL GLOVE ON HAND.

3. SLIP PARTIALLY GLOVED HAND UNDER CUFF OF SECOND GLOVE.

4. PULL SECOND GLOVE OVER OTHER HAND AND PULL GLOVE UP TO GOWNED WRIST.

5. SLIPPING FINGERS OF COMPLETELY GLOVED HAND UNDER CUFF OF FIRST HAND, PULL GLOVE TO GOWNED WRIST.

6. GLOVING PROCEDURE COMPLETED.

154.170

Figure 5-2.—Gloving.

- Thoroughly scrub all furniture used in the room, including the wheels.

- Clean metal buckets and other waste receptacles and, if possible, put through the washer/sterilizer.

- Clean scrub sinks.

- Machine scrub the entire floor in each room. If a machine is not available, use a large floor brush.

- Suction up the disinfectant germicide solution that is used on the floor, using a wet vacuum. If mops are used, make sure a clean mop head is used for each room. The use of mops in the operating room is the LEAST DESIRABLE method of cleaning.

GENERAL SAFETY PRECAUTIONS IN THE OPERATING ROOM

Since safety practices are important to emphasize, this section will cover some of the situations that are potentially hazardous, and discuss what might be done to eliminate the hazard.

All personnel should know the location of all emergency equipment. This includes drugs, cardiac arrest equipment, and resuscitators. All electrical equipment and plugs must be of the explosion-proof type and bear a label stating such. There should be written schedules of inspections and maintenance of all electrical equipment. Navy regulations prohibit the use of explosive anesthetics in the operating room. These regulations, however, do not mean we can lessen our concern for fire and explosion hazards. The surface of the floors in the operating room must provide a path of electrical conductivity between all persons and equipment making contact with the floor to prevent the accumulation of dangerous electrostatic charges. All furniture and equipment should be constructed of metal or of other electrically conductive material and should be equipped with conductive leg tips, casters, or equivalent devices. Periodic inspections should be made of leg tips, tires, casters, or other conductive devices on furniture and equipment. This will ensure that they are maintained free of wax, lint, or other foreign material that may insulate them and defeat the purpose for which they are used. Excess lubrication of casters should be avoided to prevent accumulation of oil on conductive wheels. Dry graphite and graphite oil are preferable lubricants.

Rubber accessories for anesthesia machines should be of the conductive type, should be plainly labeled as such, and should be routinely tested to ensure that conductivity is maintained. It is essential that all replacement items be of conductive material.

All personnel entering the operating room should be in electrical contact with the conductive floor through the wearing of conductive footwear or an alternative method of providing a path of conductivity. Conductive footwear and other personnel-to-floor conductive equipment should be tested on a regularly scheduled basis.

All apparel worn in the operating room should be made of a nonstatic-producing material. 100% cotton fabrics are the most acceptable. Fabrics made of synthetic blends may be used only if they have been treated by the manufacturer for use in the operating room. Wool blankets and apparel made of untreated synthetic fabrics are not permitted in the operating room.

Operating rooms must have adequate air conditioning equipment to maintain relative humidity and temperature within a constant range. The relative humidity should be kept at 55% to 60%. This level will reduce the possibility of electrostatic discharge and possible explosion of combustible gases. The temperature should be chosen on the basis of the well being of the patient. The recommended temperature is between 65% and 74%F. The control of bacteria carried on dust particles is facilitated when the recommended humidity and temperature are maintained.

All oxygen cylinders in use or in storage will be tagged with a DD Form 1191, Warning Tag for Medical Oxygen Equipment, and measures will be taken to ensure compliance with instructions 1 through 7 printed on the form. An additional tag is required on all oxygen cylinders to indicate "EMPTY, IN USE, OR FULL." Safety precautions should be conspicuously posted in all areas in which oxygen cylinders are stored and in which oxygen therapy is being administered. This posting should be made so it will immediately make all personnel aware of the precautionary measures required in the area.

All electrical service equipment, switchboards, or panelboards should be installed in a nonhazardous location. Devices or apparatus that tend to create an arc, sparks, or high temperatures must not be installed in hazardous locations unless these devices are of a type approved in accordance with the National Electrical Code. Lamps in a fixed position will be enclosed and will be properly protected by substantial metal guards or other means where exposed to breakage. Cords for portable lamps or portable electrical appliances must be continuous and without switches from the appliance to the attachment plug. Such cords must contain an insulated conductor to form a grounding connection between the electrical outlet and the appliance.

NUTRITION

Nutrition is a scientific term applied to the process by which food elements are taken into the body to produce energy for body activity, rebuild body tissue, and assist in regulating all body functions. To meet these body needs, it is essential that a person's diet contain a proper balance of the essential food elements that include carbohydrates, fats, proteins, vitamins, minerals, and water. Because the well-nourished person is generally mentally and physically alert and fairly resistant to disease, dietary intake is an important factor in the diagnostic and therapeutic plan of the consumer who requires a health care service.

NUTRITIVE SUBSTANCES

Carbohydrates are the most efficient source of energy. They provide work energy for body activities and heat energy for the maintenance of body temperature. Additionally, they are easily metabolized to provide quick energy. They may also be stored in the liver as glycogen to be used by the body when they are needed at a later time. Carbohydrates are divided into two groups—sugars (such as in fruits, honey, and jellies) and starches (such as bread, potatoes, and rice). When taken in excess carbohydrates are converted to adipose (fat) tissue and contribute to an overweight condition. When carbohydrates are taken too sparingly, the body metabolizes its fats and then its protein resources and this eventually contributes to undesirable weight loss.

Fats are nutritive substances that compose the most concentrated source of energy of all the elements. Similar to carbohydrates, they provide the body with work and heat energy resources. Fats function as carriers for the fat soluble vitamins (A, D, E, and K), as padding for the organs and subcutaneous tissue, and as an energy resource when stored as adipose tissue. Common sources of fats are butter, milk, oil, and fatty meats. They are not as easily or quickly metabolized as carbohydrates and in excess contribute to overweight, digestive, and cardiovascular problems.

Proteins are the most important element required by the body for tissue growth, development, maintenance, and repair. They are the main structural unit of all living cells. Proteins are expensive sources of energy since the body does not maintain reserve stores. Because of this, a constant source of protein is required in the daily diet to avoid a deficiency condition. Some of the best sources of protein are found in meat, fish, eggs, and legumes (i.e., peas, beans).

Vitamins are natural components of most foods and are essential for proper growth and maintenance of health. They are needed by the body in minute amounts but play a vital role in metabolism, helping convert carbohydrates, fats, and proteins into energy. It should be noted that they do not furnish energy or act as tissue building materials. Some vitamins can be stored in the body, and thus, in some people vitamin abuse can be dangerous. An example of this is the excessive use of vitamin A. Vitamins are classified as either water soluble or fat-soluble. Niacin, folic acid, the B-complex, and C vitamins are transported throughout the body in water, and are classified as water-soluble. These vitamins are not stored in the body to any great extent and excesses in intake are generally excreted by the kidneys. Vitamins A, D, E, and K are transported throughout the body in fats, and are called fat-soluble. As stated above, many fat-soluble vitamins are stored in the body.

Although the mineral elements constitute only a small portion of the total body composition, they are essential substances in the building and maintenance of bones, teeth, and various body systems. Some minerals are found in large amounts in the body. Others, detectable in small amounts, are referred to as trace minerals. Regardless of their quantitative amounts, those minerals essential to support and maintain optimal health are calcium, phosphorus, magnesium, iron, iodine, potassium, sodium, chlorine, sulfur, and fluorine.

For mineral needs to be met satisfactorily, the consumption of each element must be sufficient to cover body tissue requirements and to meet the changing physiological needs due to growth or environmental changes. It was once believed that any diet adequate in other respects would also provide an adequate intake of the essential minerals. This is not true. Different foods vary greatly in their mineral content and the same type of food produced in various geographic localities may differ considerably in the percentage composition of the individual minerals. The differences in an individual's eating habits may also result in considerable variations in the mineral intake.

Water, although not a food, is essential for the maintenance of life and health and is an integral part of most foods. It is by far the largest single constituent of the body, comprising almost two-thirds of the total body weight. Of the substances essential to life, water stands second only to oxygen. Without oxygen, humans can survive only a few minutes; without water, they may survive for a period of hours or a few days, depending upon many circumstances.

Water is the great solvent in the body. All basic body constituents are held in water, and it is the medium in which all chemical reactions take place in the body. It functions as a vehicle for nutrients, secretions, and most body substances, and because it is an essential element of the protoplasm of cells, it serves as a building material for growth and repair.

To maintain metabolic equilibrium, water intake must equal water output. The water loss through urine, feces, skin, and lungs must be replaced by water in food, water from the oxidation of food, and fluid intake. Under normal conditions, thirst is usually an adequate guide of the water requirement. When the body is in negative water balance, the condition known as dehydration results. Among its effects are the following:

- Loss of weight due to reduction in tissue water as well as to breakdown of body substances.

- Disturbance in acid-base balance usually toward the acid side, resulting in acidosis (insufficient water places a heavy burden on the kidneys impairing their ability to eliminate waste products through the urine).

- Elevations in body temperature as a result of reduced circulating fluid and subsequent reduced perspiration.

- Exhaustion and collapse.

METABOLISM

As previously stated, one of the important functions of food is to provide the body with heat and energy. This is accomplished through the process of metabolism that functions in the following manner. In the various cells and tissues of the body, food substances, in combination with oxygen taken into the body through the lungs, are burned or oxidized, producing heat and energy. The heat that is generated is used for the control of body temperature, and the energy that is produced provides for the muscular activity and movements of the body.

Caloric Value of Foods

The unit of measure of heat production is the calorie. This is the amount of heat energy that is required to raise the temperature of 1 gram (g) of water 1 degree centigrade (C). In food chemistry and metabolism, the large calorie (KCal.) is the unit of energy measurement used. One large calorie is 1000 times the size of a standard calorie. The amount of heat energy in terms of calories resulting from oxidation of foodstuffs is the caloric value of the food. By careful analysis, specific caloric values of the basic organic foods have been determined to be the following:

- 1 gram of PROTEIN yields 4 calories
- 1 gram of CARBOHYDRATES yields 4 calories
- 1 gram of FAT yields 9 calories

Most foodstuffs are not pure basic elements, and the exact caloric value of the various compound foods containing more than one of each of the three basic materials cannot be determined precisely. However, laboratory determinations have provided relative caloric values of most representative foods. The following are a few typical examples:

1 slice of bread or small potato	70 calories
1 pat of butter	45 calories
1 glass of whole milk	170 calories
1 small banana	80 calories
12 peanuts	90 calories
1 average serving of steak or ground beef	200 calories
1 candy bar	300 calories
1 serving of fruit pie	300 calories

It should be noted that alcoholic beverages provide 7 calories for each gram of alcohol, but these calories are nonnutritious.

Basal Metabolic Rate

The basal metabolic rate (BMR) is an index of the energy demand of the body for the maintenance of life and body functions under basic conditions. Increased activity requires more fuel and oxygen in proportion to the degree of heat and energy requirements.

The energy requirements of a normal 150-pound man under situations of varying activity are approximately:

Forms of activity	Calories
8 hours of sleep (60 calories per hour)	480
3 hours of light exercise, going to and from work, etc. (200 calories per hour)	600
8 hours of ward duty (220 calories per hour)	1,760
5 hours of recreation watching TV = 90 calories per hour x 5 = 450 swimming = 500 calories per hour x 5 = 2,500	450-2,500
Total for the day	3,290-5,340

To maintain body weight without loss or gain, this individual would have to consume food in amounts and kinds to yield 3,290 to 5,340 calories depending on his activity. Since we have assumed this man to be a normal individual, without a disease state or glandular imbalance, if he consumed more, he would gain weight; if he consumed less, he would lose weight. This balancing of food intake against energy requirement is the only sound basis of weight control with the maintenance of a balanced diet that ensures adequate amounts of all the essential nutrients.

THE ADEQUATE DIET

The three specifications that an adequate diet must have are the following:

- Protein for growth and maintenance of body cells.

- Minerals, vitamins, and water for growth, maintenance, and regulation of body processes.

- Fats and carbohydrates for energy.

No single food can be designated essential for life or health. Most food contains one or more nutrients, but no single one contains all the nutrients in the needed amounts. Therefore, choosing foods wisely means selecting foods that together supply nutrients in the needed amounts.

A food guide called the Four Food Groups has been devised to ensure an adequately balanced, daily diet. Listed below are the basic four food groups and some major nutrients included in each group.

- Grain Group—this group furnishes significant amounts of protein, iron, and many of the B vitamins. Also included are carbohydrates that not only provide a quick energy source but also supply the body with roughage. Specific foods of this group are all breads and cereals that are whole-grained, restored, or enriched. Many of the cereal products furnish many vitamins and minerals. Additionally, foods such as rice, noodles, macaroni, cornmeal, and grits are also included in this group.

- Meat Group—this group provides a major source of protein, iron, and the B-complex vitamins. Included in the meat group are beef, veal, lamb, pork, and the organ nutrients such as liver and kidney. Fish, shellfish, poultry, and eggs are also included in the meat group. Foods such as beans, peas, and nuts are alternative sources of protein, which are categorized in the meat group; however, these nutrients are not as high in protein as are the other foods in the group.

- Milk Group—this group supplies the body with calcium, some high quality protein, and vitamins, especially A and riboflavin (B_2). Foods included in this group are whole, evaporated, skim, and dry milk. Also included are butter, buttermilk, ice cream, and a wide variety of cheeses.

- Vegetable/Fruit Group—this group provides a major source of vitamins and minerals. Almost all of the body's vitamin C requirements and half of its vitamin D requirements are furnished by this group. Such foods as cantaloupe, grapefruit, oranges, strawberries, and green peppers are good sources of vitamin C. Apricots, peaches, asparagus, carrots, broccoli, brussel sprouts, spinach, and sweet potatoes are excellent sources of vitamin D.

Each day the healthy adult requires 4 servings from the grain group, 2 from the meat group, 2 from the milk group, and 4 from the vegetable/fruit group for a nutritious healthful diet.

DIET THERAPY

An important part of the total health care management of the patient is the dietary plan. Basically a patient's diet therapy consists of either a regular or special diet. The goals of both categories are to provide for either normal life cycle, or special dietary requirements that are necessary for treating disease or injury and for rehabilitating the patient. Regular diets are planned in accordance with an individual's specific life cycle, such as found among pediatric, adult, maternal, or geriatric populations. Special diets, commonly called therapeutic diets, are planned or changed in one or a combination of the following methods:

- Modification of total calories
- Modification of consistency
- Modification of levels of nutrients
- Elimination of specific foods
- Preparation methods

An individual's nutritional care consists of the following four essential elements: assessment, planning, implementation, and evaluation. All of these elements are necessary for the successful provision of effective health care. Assessment provides the health care team with an estimate of the patient's nutritional status upon admission and provides a basis for planning diet therapy during hospitalization. Dietary implementation and monitoring guide the health care team in evaluating and adjusting both optimal calorie and nutritional intake. These contribute to the patient's total care by reducing tissue healing time, decreasing susceptibility to infection, and providing for an optimal physical and biochemical status.

To summarize briefly, the overall objectives of planned and implemented diet therapy are to:

- Prevent nutritional deficiency
- Improve and maintain the very best nutritional status
- Aid the maintenance and reestablishment of a positive state of well-being in persons with a medical or physical problem
- Identify problems associated with overnutrition and undernutrition and decide when these problems put a patient at a high nutritional risk.

THE MEDICAL PATIENT

For purposes of this discussion, the term medical patient will be considered as any person who is receiving diagnostic, therapeutic, and supportive care for a condition that is not managed by surgical, orthopedic, psychiatric, or maternity related therapy. This is not to infer that patients in these other categories are not treated for medical problems. Many surgical, orthopedic, psychiatric, and maternity patients do have secondary medical problems that are treated while they are undergoing management for their primary condition. Although many medical problems can be treated on an outpatient basis, this discussion will address the hospitalized medical patient. It should be noted that the basic principles of management are essentially the same for both the inpatient and outpatient.

The medical management of the patient generally consists of laboratory and diagnostic tests and procedures, medications, food and fluid therapy, and patient teaching. Additionally, for many medical patients, particularly during the initial treatment phase, rest is a part of the prescribed treatment.

TEST AND PROCEDURES

A variety of laboratory and diagnostic tests and procedures are commonly ordered for the medical patient. Frequently the hospital corpsman is assigned to prepare the patient for the procedure, collect specimens, or assist with both procedure and specimen collection. Whether a specimen is to be collected or a procedure is to be performed, the patient needs a clear and simple explanation about what is to be done and what the patient can do to assist with the activity. Often the success of the test or procedure is dependent upon the patient's informed cooperation. When collecting specimens, the hospital corpsman must complete the following:

- Collect the correct kind and amount of specimen at the right time
- Place the specimen in the correct container
- Label the container completely and accurately. This often differs somewhat for each facility and local policies should be consulted
- Complete the laboratory request form accurately
- Record on the patient's record and other forms as appropriate, the date, time and kind of specimen collected, the disposition of the specimen, and anything unusual about the appearance of the specimen or the patient during the collection.

When assisting with a diagnostic procedure, the hospital corpsman must understand the sequence of steps of the procedure and exactly how his or her assistance can best be provided. Since many procedures terminate in the collection of a specimen, the above principles of specimen collecting must be followed. Following the completion of a procedure or specimen collection, it is the responsibility of the assisting hospital corpsman to ensure that the patient's safety and comfort have been attended to, the physician's orders are accurately followed, and that any supplies or equipment used are appropriately disposed of.

MEDICATIONS

A major form of therapy for the treatment of illness is the use of drugs. It is not uncommon for the medical patient to be treated with several drugs. As members of the health care team, Hospital Corps personnel assigned to preparing and administering medications are given a serious responsibility demanding constant vigilance, integrity, and special knowledge and skills. The preparation and administration of medications was addressed in great detail in the curriculum of basic Hospital Corps School. The entire chapter 6 of the *Nursing Procedures Manual,* NAVMED P-5066, 1980 edition, addresses the subject of medications. These references and the continued inservice training devoted to medication administration at all medical facilities support the importance of accurate preparation and administration of drugs.

An error (which also includes omissions) can seriously affect a patient, even to the point of causing death. Each hospital corpsman is responsible for his or her own actions, and this responsibility cannot be transferred to another. No one individual is expected to know all there is to know about all patients and medications. However, in every health care environment, the hospital corpsman has access to other health care providers who can assist in clarifying orders, explaining the purposes, actions, and effects of drugs, and in general answering any questions that may arise concerning a particular patient and his or her medications. There should be basic drug references available to all personnel handling medications; including the *Physician's Desk Reference,* and a *Hospital Formulary.* As a hospital corpsman, it is your responsibility to consult these members of the team and these references for assistance in any area in which you are not knowledgeable or whenever you have questions or doubts. You are also responsible for knowing and following local policies and procedures regarding the administration of medications.

FOOD AND FLUID THERAPY

An entire section of this chapter addressed the subject of nutrition. The following will be a brief discussion on food and fluid as it relates specifically to the medical patient. Loss of appetite, food intolerance, digestive disturbances, lack of exercise, and even excessive weight gain influence a medical patient's intake requirements. Regardless of their medical problem, patients have basic nutritional needs that frequently differ from those of the healthy person. As a part of the patient's therapeutic regimen, food is usually prescribed in the form of a special diet. Regardless of the kind and diet prescribed, the patient must understand why certain foods are ordered or eliminated and how compliance with the regimen will assist in his or her total care. It is the responsibility of the corpsman to assist the patient in understanding the importance of the prescribed diet and to ensure that accurate recording of the patient's dietary intake is made on the clinical record.

In many disease conditions, the patient is unable to tolerate food or fluids or may lose these through vomiting, diarrhea, or both. In these cases, replacement of fluids as well as nutrients is an important part of the patient's medical management. On the other hand, there are several disease conditions in which fluid restrictions are important aspects of the patient's therapy. In both of these instances, accurate measurement and recording of fluid intake and output must be carefully performed. Very frequently this becomes a major task of the staff Hospital Corps personnel.

PATIENT TEACHING

Earlier in this chapter, under the heading "Health Education," the goals and principles of patient teaching were addressed. When taken in the context of the medical patient, there are some general areas of patient teaching needs that must be considered, particularly as the patient approaches discharge from an inpatient status. They include the following:

- Followup appointments
- Modification in daily living activities and habits
- Modification in diet, including fluid intake
- Medications and treatment to be continued after discharge
- Measures to be taken to promote health and prevent illness

REST

The primary reason for prescribing rest as a therapeutic measure for the medical patient is to prevent further damage to the body or a part of the body when the normal demand of use exceeds the ability to respond. However, prolonged or indiscriminate use of rest, particularly bed rest, is potentially hazardous. Some of the common complications occurring as a result of prolonged bed rest are:

- Circulatory problems such as development of thrombi and emboli and subsequent skin problems such as decubiti
- Respiratory problems such as atelectasis and pneumonia
- Gastrointestinal problems such as anorexia, constipation, and fecal impactions
- Urinary tract problems such as retention, infection, or the formation of calculi
- Musculoskeletal problems such as weakness, atrophy, and the development of contractures
- Psychological problems such as apathy, depression, and temporary personality changes

The key concept in the therapeutic management of the patient on prolonged bed rest is the prevention of complications resulting from this one aspect of the total care regimen. Awareness of the potential hazards is the first step in prevention. Alert observations of skin condition, respirations, food and fluid intake, urinary and bowel habits, evidence of discomfort, range of motion, and mood are critical elements that provide data indicating impending problems. When this data is properly reported, the health care team has time to employ measures that will arrest the development of preventable complications.

THE SURGICAL PATIENT

Surgical Procedures are classified into two major categories: emergency and elective. Emergency surgery is that required immediately to save a life or maintain a necessary function. Elective surgery is that which, in most cases, needs to be done but can be scheduled at a time beneficial to both the patient and the provider. Regardless of the type of surgery, every surgical patient requires specialized care at each of four phases. These phases are classified as preoperative, operative, recovery, and postoperative. The following discussion will address the basic concepts of care in each phase.

PREOPERATIVE

Before undergoing a surgical procedure, the patient must be in the best possible psychological, spiritual, and physical condition. Psychological preparation begins the moment the patient learns he or she is going to have an operation. The physician is responsible for explaining the surgical procedure to the patient including the events that can be expected afterwards. Since other staff personnel reinforce the physician's explanation, all members of the team must know what the physician has told the patient. In this manner, they are better able to answer the patient's questions. All patients approaching surgery are fearful and anxious. The staff can assist in reducing this fear by instilling confidence in the patient regarding the competence of those providing the care. The patient should be given the opportunity and freedom to express any feelings or fears concerning the proposed procedure. Even in an emergency, it is possible to give a patient and the family psychological support. Often this is accomplished simply by the confident and skillful manner in which the administrative and physical preoperative preparation is done.

People who face operations are often afraid. This fear can be related to fear of anesthesia, body disfigurement, pain, and even death. Frequently, religious faith is a source of strength and courage for these patients. If a patient expresses a desire to see a clergyman, every attempt should be made to arrange a visit.

Except in emergencies, the administrative preparation usually begins the day before surgery. Since the step by step procedure is clearly delineated in the *Nursing Procedures Manual* (NAVMED P-5066) in the section titled "Preoperative Care" the entire procedure will not be repeated here. The Request for Administration of Anesthesia and for Performance of Operations and Other Procedures (SF 522) will be addressed here. This document identifies the operation or procedure to be performed, has a statement written by the patient indicating in lay terms a description of the procedure, and includes signatures of the physician, patient, and a staff member who serves as a witness. The SF 522 must be completed before any preoperative medications are administered. If the patient is not capable of signing the document, a parent, legal guardian, or spouse may sign it. It is customary to require the signature of a parent or legal guardian if the patient is under 21 years of age, unless the patient is married or a member of the Armed Forces. In these latter two cases, the patient may sign his or her own permit, regardless of age.

Normally the physical preparation of the patient begins in the late afternoon or early evening the day before surgery. As with the administrative preparation, each step is clearly stated in the *Nursing Procedures Manual.* Also in the same document, listed under "Skin Preparation," you will find a description of both the purpose and procedure for performing the preoperative shave.

Preoperative teaching is an important part of the total preparation. The exact time that preoperative teaching should be initiated greatly depends upon the individual patient and type of surgical procedure. Most experts recommend that preoperative instruction be given as close as possible to the time of surgery. Appropriate preoperative instructions given in sufficient detail and at the proper time greatly reduce operative and postoperative complications.

OPERATIVE

The operative, or intraoperative phase as it is sometimes called, begins the moment the patient is taken into the operating room. Two of the major factors to consider at this phase are positioning and anesthesia. The specific surgical procedure will dictate the general position of the patient. For example, the lithotomy position is used for a vaginal hysterectomy; whereas, the dorsal recumbent position is used for a herniorrhaphy. Regardless of the specific position the patient is placed in, there are some general patient safety guidelines that must be observed. When positioning a patient on the operating table, remember the following:

- Whether the patient is awake or asleep, place the patient in as comfortable a position as possible.
- Strap the patient to the table in a manner that
    - allows for adequate exposure of the operative site.
    - is secure enough to prevent the patient from falling, but does not cut off circulation or contribute to nerve damage.
- Secure all extremities of the patient in a manner that will prevent them from dangling over the side of the table.
- Pad all bony prominences to prevent the development of pressure areas or nerve damage.
- Make sure the patient is adequately grounded to avoid burns or electrical shock to either the patient or the surgical team.

Anesthesia

One of the greatest contributions to medical science was the introduction of anesthesia. It relieves unnecessary pain and increases the potential and scope of many kinds of surgical procedures. Therefore, health care providers must understand the nature of anesthetic agents and their effect on the human body.

Anesthesia may be defined as a loss of sensation that makes a person insensible to pain with or without a loss of consciousness. Some specific anesthetic agents are discussed in the "Pharmacology and Toxicology" chapter of this manual. Health care providers must understand the basics of anesthesiology as well as the specific drug's usage.

Classifications of Anesthesia

The two major classifications of anesthesia are regional and general. Regional anesthetics reduce all painful sensations in a particular area of the body without causing unconsciousness. The following is a listing of the various methods and a brief description.

Regional anesthesia

- Topical anesthesia—administered topically to desensitize a small area of the body for a very short period of time.

- Local block—consists of the subcutaneous infiltration of a small area of the body with a desensitizing agent. Local anesthesia generally lasts a little longer than topical.

- Nerve block—consists of injecting the agent into the region of a nerve trunk or other large nerve branches. This form of anesthesia blocks all impulses to and from the injected nerves.

- Spinal anesthesia—consists of injecting the agent into the subarachnoid space of the spinal canal between the 3rd and 4th lumbar space or between the 5th lumbar and 1st sacral space of the spinal column. This form of anesthesia blocks all impulses to and from the entire area below the point of insertion, provided the patient's position is not changed following injection of the agent. If the patient's position is changed, for example, from dorsal recumbent to Trendelenburg's, the anesthetic agent will move up the spinal column and the level of anesthesia will also move up. Because of this, care must be exercised in positioning the patient's head and chest above the level of insertion to prevent paralysis (by anesthesia) of the respiratory muscles. In general, spinal anesthesia is considered the safest for most routine major surgery.

- Epidural block—consists of injecting the agent into the epidural space of the spinal canal at any level of the spinal column. The area of anesthesia obtained is similiar to that of the subarachnoid spinal method. The epidural method is frequently used when continuous anesthesia is desired for a prolonged period. In these cases, a catheter is inserted into the epidural space through a spinal needle. The needle is removed, but the catheter is left in place. This provides for continuous access to the epidural space.

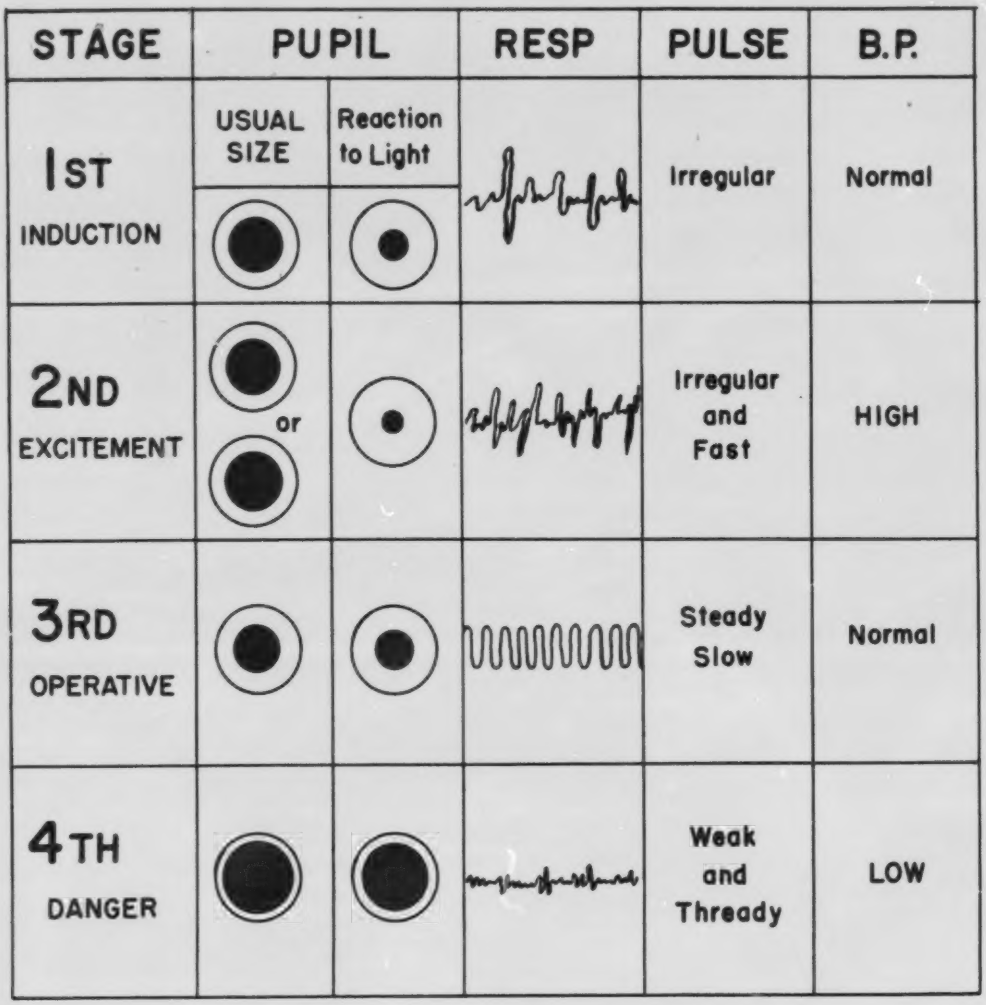
- Saddle block—consists of injecting the agent into the dural sac at the 3rd and 4th lumbar space. This form of anesthesia blocks all impulses to and from the perineal area of the body.

- Caudal block—consists of injecting the agent into the sacral canal. With this method anesthesia is obtained from the umbilicus to the toes.

General Anesthesia

General anesthetics cause total loss of sensation and complete loss of consciousness in the patient. They are administered by inhalation of certain gases or vaporized liquids, intravenous infusion, or rectal induction. The induction of inhalation anesthesia is divided into four stages. These stages and the body's main physiological reaction in each phase are explained below and depicted in figure 5-3.

- Stage 1 is called the stage of analgesia or induction. During this period, the patient



STAGE	PUPIL		RESP	PULSE	B.P.
	USUAL SIZE	Reaction to Light			
1ST INDUCTION				Irregular	Normal
2ND EXCITEMENT	or			Irregular and Fast	HIGH
3RD OPERATIVE				Steady Slow	Normal
4TH DANGER				Weak and Thready	LOW

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Figure 5-3.—Stages of Anesthesia.

experiences dizziness, a sense of unreality, and a lessening sensitivity to touch and pain. At this stage, the patient's sense of hearing is increased and responses to noises are intensified (fig. 5-3).

- Stage 2 is the stage of excitement. During this period, there is a variety of reactions involving muscular activity and delirium. At this stage, the vital signs show evidence of physiological stimulation. It is important to remember that during this stage the patient may respond violently to very little stimulation (fig. 5-3).

- Stage 3 is called the surgical or operative stage. There are four planes to this stage. It is the responsibility of the anesthesiologist or anesthetist to determine which plane is optimal for the procedure. The determination is made according to specific tissue sensitivity of the individual and the surgical site. Each successive plane is achieved by increasing the concentration of the anesthetic agent in the tissue (fig. 5-3).

- Stage 4 is called the toxic or danger stage. Obviously this is never a desired stage of anesthesia. At this point, cardiopulmonary failure and death can occur. Once surgical anesthesia has been obtained, the health provider must exercise care to control the level of anesthesia. Plane 4 of stage 3 is demonstrated by cardiovascular impairment that results from diaphragmatic paralysis. If this plane is not corrected immediately, stage 4 quickly ensues (fig. 5-3).

RECOVERY

For purposes of this discussion, the recovery phase consists of the period that begins at the completion of the operation and extends until the patient has recovered from anesthesia. The recovery phase generally takes place in a specialized area called the recovery room. This unit is usually located near the operating room and has access to the following:

- Surgeons and anesthesiologists or anesthetists
- Nurses and Hospital Corps personnel who are specially prepared to care for immediate postoperative patients
- Special equipment, supplies, medications, and replacement fluids

From the time of admission to the point of discharge, routine care in the recovery room consists of the following:

- Measuring temperature and vital signs
    - Take immediately upon admission and as ordered by the physician thereafter
- Maintaining airway patency
    - Patients having an artificial airway in place will automatically expel it as they regain consciousness.
    - Have a mechanical suction apparatus available to remove excessive secretions from the patient's airway
- Ensuring the integrity of dressings, tubes, catheters, and casts
    - Locate the presence of any of the above
    - Make notations regarding all drainage including color, type, and amount
    - Immediately report the presence of copious amounts of drainage to the nurse or physician
- Monitoring intravenous therapy (including blood and blood components)
    - Make notations including type of infusion, rate of flow, and condition of the infusion site.
    - Observe patients receiving blood or blood components closely for untoward reactions
- Monitoring skin color changes
    - Check dressings and casts frequently to ensure they are not interfering with normal blood circulation to the area
    - Notify the physician or nurse of general skin color changes that may indicate airway obstruction, hemorrhage, or shock.
- Assessing level of responsiveness
    - For general anesthetic, check for orientation to environment each time vital signs are taken
    - For regional anesthetic, check for return of sensory perception and voluntary movement each time vital signs are taken
- Observing for side effects of the anesthetic agent. Each agent has the potential for causing specific side effects. Some common major side effects that may occur following the administration of both spinal and general anesthesia consist of the following:
    - Spinal:
        - Hypotension/Shock
        - Respiratory paralysis
        - Neurological complications
        - Headache

- General:
  - Cardiac arrest
  - Respiratory depression
  - Bronchospasm/Laryngospasm
  - Diminished circulation
  - Hypotension/Shock
  - Vomiting/Aspiration

POSTOPERATIVE

After the patient's status has stabilized in the recovery room, a physician will order his or her transfer to another area in the facility. Generally this transfer is to the unit that the patient was assigned to preoperatively. Since both surgery and anesthesia have unavoidable temporary ill effects on the normal physiological functions, every effort must be made to prevent postoperative complications. From the time the patient is admitted to the recovery room to the time he or she has recovered from the operation, there are definite goals of care that guide the entire postoperative course. These goals consist of the following:

- Promoting respiratory function
- Promoting cardiovascular function
- Promoting renal function
- Promoting nutrition and elimination
- Promoting fluid and electrolyte balance
- Promoting wound healing
- Encouraging rest and comfort
- Encouraging movement and ambulation
- Preventing postoperative complications

The physician will write orders for postoperative care that are directed at accomplishing the above goals. Although each patient's orders will be based on individual needs, there will be some common orders that apply to all patients. These orders will center around the promotion of certain physiological functions and are addressed in the following paragraph.

Respiratory function is promoted by encouraging frequent coughing and deep breathing. Early movement and ambulation also help improve respiratory function. For some patients, oxygen therapy may also be ordered to assist respiratory function. Cardiovascular function is assisted by frequent position changes, by early movement and ambulation, and, in some cases, by intravenous therapy. Renal function is promoted by adequate fluid intake and early movement and ambulation. Nutritional status is promoted by ensuring the patient receives and consumes the prescribed diet, and by early movement and ambulation. Fluid and electrolyte balance is promoted by ensuring adequate oral or correct intravenous intake, and by maintaining accurate intake and output records. Elimination functions are promoted by adequate diet and fluid intake. Postoperative patients should be advanced to a normal dietary regimen as soon as possible since this too promotes elimination functions. Early movement and ambulation also helps restore normal elimination activities. In addition to various medications and dressing change procedures ordered by the physician, wound healing is promoted by good nutritional intake and by early movement and ambulation. Rest and comfort are supported by proper positioning of the patient; by providing a restful environment; by encouraging good basic hygiene measures; by ensuring optimal bladder and bowel output; and by prompt administration of pain relieving medications. Early movement and ambulation are assisted by ensuring maximum comfort for the patient, and by providing the encouragement and support for ambulating the patient, particularly in the early postoperative period. As indicated in the above discussion, the value of early movement and ambulation, when permissible, cannot be overemphasized.

During the early postoperative phase, the major complications to be guarded against are respiratory obstruction, shock, and hemorrhage. As the patient progresses in the postoperative period, other complications to avoid are the development of pneumonia, phlebitis and subsequent thrombophlebitis, gastrointestinal problems ranging from abdominal distension to intestinal obstruction, and finally wound infections. Accurate implementation of the physician's orders and careful observation, reporting, and recording of the patient's condition will contribute markedly to an optimal and timely postoperative recovery course for the patient.

THE ORTHOPEDIC PATIENT

Patients on the orthopedic service are those who require treatment for fractures, deformities, and diseases or injuries of some part of the musculoskeletal system. Some patients will require surgery, immobilization, or both to correct their condition. The basic principles and concepts of care for the surgical patient will apply to orthopedic patients. The majority of patients not requiring surgical intervention will be managed by bed rest, immobilization, and rehabilitation. Many of the basic concepts of care of the medical patient are applicable for orthopedic patient care. In the military, the usual orthopedic patient is fairly young and in good general physical condition. For these patients, bed rest is prescribed only because his or her admitting condition limits other kinds of activity.

Rehabilitation is the ultimate goal when planning the orthopedic patient's total management. Whether the patient requires surgical or conservative treatment, immobilization is often a part of overall therapy. Immobilization may consist of the application of casts or traction, or the use of equipment such as orthopedic frames or CircOlectric beds. During the immobilization phase, simple basic patient care is extremely important. Such things as skin care, active-passive exercises, position changes in bed (as permitted), good nutrition, adequate fluid intake, regularity in elimination, and common basic hygiene not only contribute to the patient's physical but also psychological well-being.

Lengthy periods of immobilization are emotionally stressful for patients, particularly those who are essentially healthy except for the limitations imposed by their condition. Prolonged inactivity contributes to boredom that is frequently manifested by various kinds of acting out behavior. Additionally, the unoccupied orthopedic patient often experiences exaggerated levels of pain. Orthopedic pain is commonly described as sore and aching. Because this condition requires long periods of treatment and hospitalization, the wise management of pain is an important aspect of care. Constant pain, regardless of severity, is energy consuming. Every effort should be made to assist the patient in conserving this energy. There are times when the patient's pain can and should be relieved by medications. There are, however, numerous occasions when effective pain relief can be provided by basic patient care measures such as proper body alignment, change of position, use of heat or cold (if permitted by a physician's order), back rubs and massages, and even simple conversation with the patient. Meaningful activity also has been found to help relieve pain. Whenever possible a well planned physical/occupational therapy regimen should be an integral part of the the total rehabilitation plan.

THE TERMINALLY ILL PATIENT

The terminal patient has many needs that are basically the same as those of other patients: spiritual, psychological, cultural, economic, and physical. What differs in these patients may be best expressed as the urgency to resolve the majority of these needs within a limited time frame. Death comes to everyone in different ways and at different times. For some patients, death is sudden following an acute illness. For others, death follows a lengthy illness. Death not only affects the individual patient; it affects family and friends, staff, and even other patients. Because of this, it is essential that all health care providers understand the process of dying and its effects on all people.

People view death from their individual and cultural value perspectives. An individual's personal perception of death often affects their moral and religious attitude towards it. Many people find the courage and strength to face death through their religious beliefs. These patients and their families often seek support from representatives of their religious faith. In many cases, patients who previously could not identify with a religious belief or the Supreme Being concept may indicate (verbally or nonverbally) a desire to talk with a spiritual representative. There will also be patients who throughout the whole dying experience will neither desire nor need spiritual support and assistance. In all of these cases, it is the responsibility of the health care provider to be attentive and perceptive to the patient's needs and provide whatever support personnel that may be required.

An individual's cultural system influences behavior patterns. When we speak of cultural systems, we refer to certain norms, values, and action patterns of specific groups of people to various aspects of life. Dying is an aspect of life and is often referred to as the final crisis of living. In all of our actions, culturally approved roles frequently encourage specific behavior responses. For example, in the Caucasian, Anglo-European culture a dying patient is expected to show peaceful acceptance of his/her prognosis; whereas, the bereaved is expected to communicate grief. When people behave differently, the health care provider frequently has difficulty responding appropriately.

Within the last 10 years or so, a theory of death and dying has developed that provides all persons involved with the experience with highly meaningful knowledge and skills. In this theory of death and dying (as formulated by Dr. Elizabeth Kubler-Ross in her book *On Death and Dying*), it is suggested that most people (both patients and significant others) go through five stages: denial, anger, bargaining, depression, and acceptance. The first stage, denial, is one of nonacceptance. "No it can't be me, there must be a mistake!" It is not only important for the health care provider to recognize the denial stage with its behavior responses but also to realize that some people maintain denial up to the point of impending death. The next stage is anger. This is a period of hostility and questioning "Why me?" The third stage is bargaining. At this point, people revert to a culturally reinforced concept that good behavior is rewarded. Patients are often heard stating "I'd do anything if I could just turn this thing around." Once the patient realizes that bargaining is futile, they quickly enter the stage of depression. In addition to grieving because of his or her personal loss, it is at this point that the patient becomes concerned about his or her family and "putting affairs in order." The final stage comes when the patient accepts death as reality and is prepared for it. It is usually at this time that the patient's family requires more support than the patient.

Despite the fact that each of us expects to die and expects all others to die, there is no easy way to discuss death. To the strong and healthy, death is a frightening thought. The fact that sooner or later everyone dies does not make death easier. There are no procedure books that tell health care providers "how to do" death. The "how to" will only come from the individual health care provider who understands that patients are people. More than any other time in life, the dying patient needs to be treated as an individual person, not a thing, a number, or a disease.

An element of uncertainty and helplessness is almost always present when death occurs. Assessment and respect for the patient's individual and cultural value systems are of key importance in planning the care of the dying. As health care personnel, we often approach a dying patient with some feelings of uncertainty, helplessness, and anxiety. We feel helpless in being unable to perform tasks that will keep the patient alive; uncertain that we are doing all we can do to either make the patient as comfortable as possible, or to postpone or prevent death altogether. We feel anxious about how to communicate effectively with patients, their families, and even among ourselves. This is a normal response since any discussion about death carries a high emotional risk for the patient as well as the health care provider. Nevertheless, communicating can provide both strength and comfort to all if done with sensitivity and dignity, and it is sensitivity and dignity that is the essence of all health care services.

CHAPTER 6

CLINICAL LABORATORY

INTRODUCTION

A basic knowledge of clinical laboratory procedures is required of all hospital corpsmen, particularly those working at small dispensaries and isolated duty stations without the supervision of a medical officer. The patient's complaint may be of little value by itself, but coupled with the findings of a few easily completed laboratory studies, a diagnosis can usually be surmised and treatment initiated.

Hospital corpsmen who can perform blood and urine tests and interpret the results are better equipped to determine the cause of illness or to request assistance, since they can give a more complete clinical picture. Consequently, their patients can get treated sooner.

In this chapter we will discuss blood collection, the microscope, and step-by-step procedures for the complete blood count and basic urinalysis.

BLOOD COLLECTION

The two principal methods of obtaining blood samples are finger puncture and venipuncture. Both methods have their advantages and disadvantages, but for most clinical examinations, blood is best obtained from a vein.

Finger Puncture

The finger puncture is used when a patient is burned severely or is bandaged so that the veins are either covered or inaccessible. It is also used when only a small amount of blood is needed.

Equipment Required

- Sterile gauze pads (2x2)
- 70% isopropyl alcohol
- Blood lancets
- Capillary tubes
- Bandages

Arrange your equipment in an orderly manner and have it within easy reach. As with many other laboratory procedures, wash your hands prior to the procedure.

Procedure

1. Using the middle or ring finger, massage or "milk" the finger down toward the fingertip. Repeat this "milking" five or six times.
2. Cleanse the fingertip with alcohol and let dry.
3. Take the lancet and make a quick stab on the side of the finger (off-center). To obtain a large rounded drop, the puncture should be across the striations of the fingertip (fig. 6-1).
4. Wipe away the first drop of blood to avoid dilution with tissue fluid. Avoid squeezing the fingertip to accelerate bleeding as this tends to dilute the blood with excess tissue fluid, but gentle pressure some distance above the puncture site may be applied to obtain a free flow of blood.
5. When the required blood has been obtained, apply a pad of sterile gauze and instruct the patient to apply pressure, then apply a bandage.

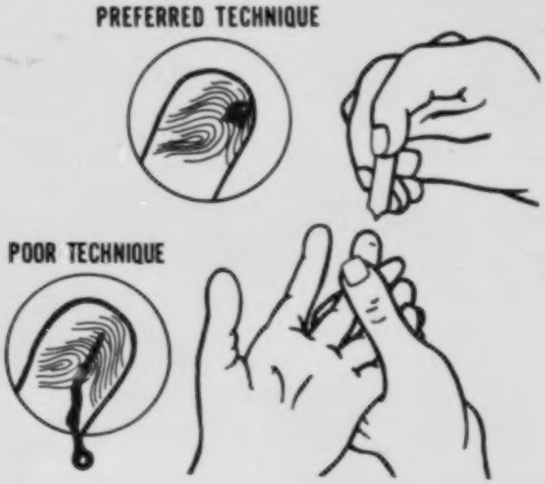

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Figure 6-1.—Finger Puncture.

When dealing with infants and very small children, the heel or great toe puncture is the best method to obtain a blood specimen. It is performed in much the same way.

Venipuncture (Vacutainer Method)

The collection of blood from a vein is called a venipuncture. For the convenience of technician and patient, arm veins are best for obtaining a blood sample. If arm veins cannot be used due to bandages, IV fluid therapy, thrombosed or hardened veins, etc., consult your supervisor for instructions on the use of hand or foot veins. DO NOT DRAW BLOOD FROM AN ARM WITH IV FLUIDS RUNNING INTO IT. CHOOSE ANOTHER SITE. THE FLUIDS ALTER TEST RESULTS.

Equipment required

- Sterile gauze pads (2x2)
- 70% isopropyl alcohol
- Tourniquet
- Vacutainer needles and holder
- Vacutainer tubes appropriate for the test to be performed.

Position the patient so that the vein is easily accessible and the technician is able to perform the venipuncture in a comfortable position. Always have the patient either lying in bed or sitting in a chair with the arm propped up. NEVER PERFORM A VENIPUNCTURE WITH THE PATIENT STANDING UP, AND USE CAUTION TO ENSURE THE PATIENT DOES NOT FALL FORWARD FROM HIS OR HER SEAT.

Procedure

1. Wash hands.

2. Assemble equipment.

3. Explain procedure to patient.

4. Apply tourniquet around arm with enough tension so that the VEIN is compressed but not the ARTERY. A sphygmomanometer may be used instead of a tourniquet if a patient is difficult to draw. Inflate the cuff midway between systole and diastole.

5. Position patient's arm extended with little or no flexion at the elbow.

6. Locate a prominent vein by palpation (feeling). If the vein is difficult to find, it may be made more prominent by massaging the arm with an upward motion to force blood into the vein.

7. Cleanse puncture site with 70% alcohol and allow it to dry.

CAUTION: After cleaning the puncture site, only the sterile needle should be allowed to touch it.

8. "Fix" or hold the vein taut. This may be accomplished by placing the thumb directly under the puncture site and exerting a light downward pressure on the skin or placing the thumb to the side of the site and pulling the skin taut laterally. (See fig. 6-2).

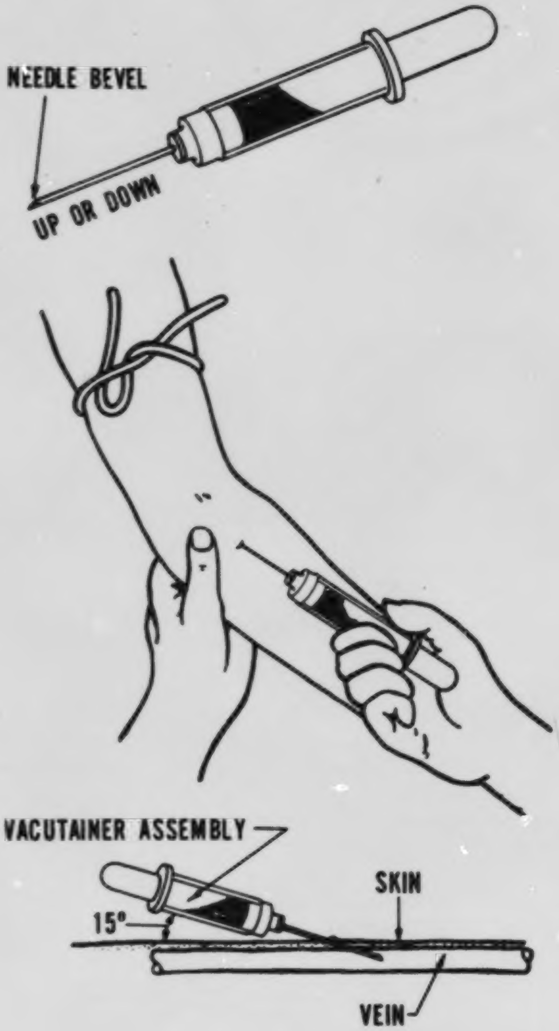

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Figure 6-2.—Venipuncture.

9. Using a smooth continuous motion, introduce the needle into the side of the vein at about a 15 degree angle with the skin (fig. 6-2). (Bevel of needle can either be up or down.)

10. Holding the Vacutainer barrel with one hand, push tube into the holder with the other hand and watch for flow of blood into the tube until filling is completed.

11. While holding the vacutainer with one hand, release tourniquet with the other.

12. Place sterile gauze over puncture site and remove needle with a quick, smooth motion.

13. Apply pressure to puncture site and instruct patient to keep the arm in a straight position. Have patient hold pressure for at least 3 minutes.

14. Take this time to invert any tubes that need to have anti-coagulant mixed with the blood, then label specimens.

15. Reinspect puncture site and apply bandage.

THE MICROSCOPE

Before any attempts are made to view blood smears, urinary sediments, bacteria, parasites, etc., it is absolutely essential that the beginner know the instrument with which he will be spending considerable time—the microscope (fig. 6-3). The microscope is a precision instrument used repeatedly in many areas of the medical laboratory to make visible those objects that are too small to be seen by the unaided eye. This is accomplished by means of a system of lenses of sufficient magnification and resolving power (ability to show, separate, and distinguish) so that small elements lying close together in a specimen appear larger and distinctly separated. Most laboratories are equipped with binocular (two-eyepiece) microscopes, available through the Navy Supply System (NSN 6650-01-019-0423), but monocular microscopes are also commonly used. The microscope most often used in the laboratory is a compound microscope that consists of the various pieces identified and discussed briefly below:

1. Framework:

Base—structure on which the microscope rests.

Arm—structure that supports the magnification and adjustment system; it is the handle by which the microscope is carried.

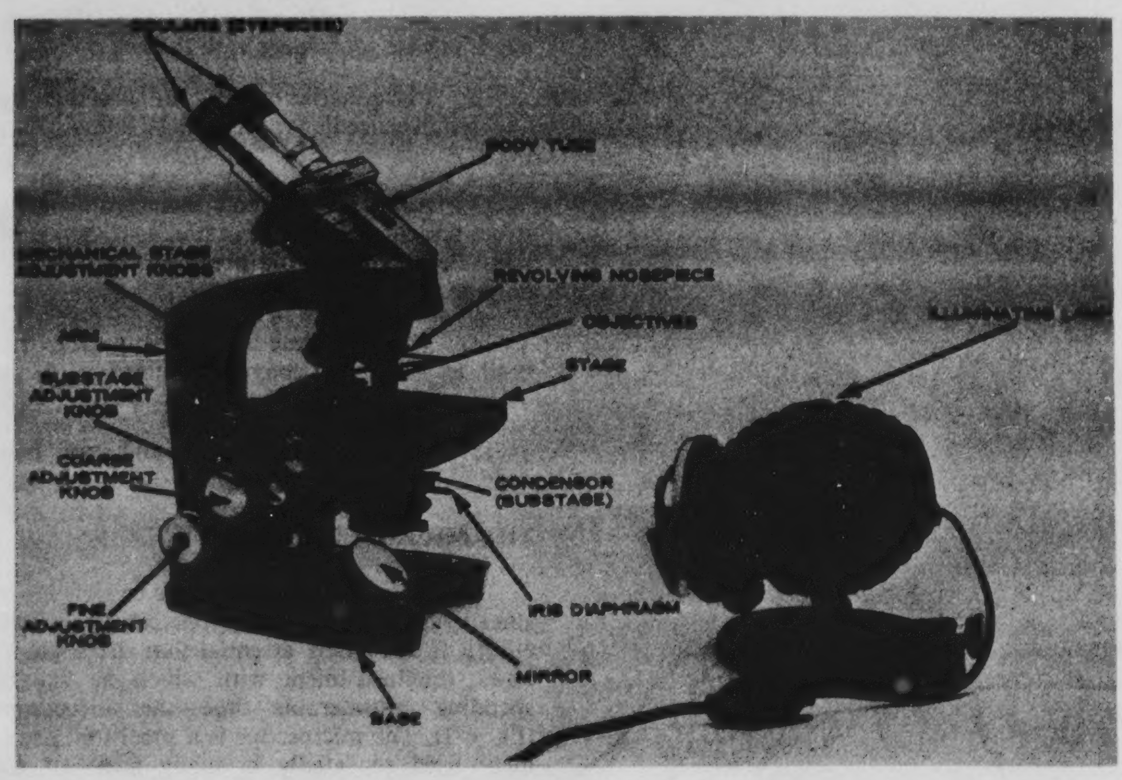
OCULARS (EYEPIECES)
BODY TUBE
MECHANICAL STAGE ADJUSTMENT KNOBS
REVOLVING NOSEPIECE
OBJECTIVES
ILLUMINATING LAMP
ARM
STAGE
SUBSTAGE ADJUSTMENT KNOB
COARSE ADJUSTMENT KNOB
CONDENSOR (SUBSTAGE)
FINE ADJUSTMENT KNOB
IRIS DIAPHRAGM
MIRROR
BASE

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Figure 6-3.—Microscope.

Stage—platform on which a preparation is placed for examination. In the center of the stage is the aperture or hole to allow passage of light from the condenser.

Mechanical stage—means by which the preparation may be moved about on the stage.

2. Illumination system:

Mirror—usually double, a flat surface on one side, and a concave surface on the other side. The concave surface is used in the absence of a condenser. Many microscopes have a built-in light source instead of a lamp and mirror.

Condenser—composed of a compact lens system located between the mirror and stage. The condenser (usually an Abbe condenser) concentrates (condenses) the light rays from their source and provides a cone of illumination through the aperture in the stage to the objective lens.

Iris diaphragm—controls the amount of light reaching the condenser. The size of the iris diaphragm opening should approximate that of the face of the objective lens. Thus, as a general rule, the diaphragm is completely closed when liquid preparations are observed with the low-power objective, and wide open when stained preparations are observed with the oil-immersion lens using natural light.

3. Magnification System:

Revolving nosepiece—contains openings into which objective lenses may be fitted and which may be revolved to bring an objective into the desired position.

Objective lenses—usually a set of three consisting of a low-power lens (approximate focus 16 mm, magnification 10X), a high-power lens (approximate focus 4 mm, magnification

43X), and an oil-immersion lens (approximate focus 1.8 mm, magnification 95X). Numerical aperture (NA) refers to the angle of the maximum cone of light that may enter the objective. The greater the numerical aperture, the greater the resolution, or ability of the microscope to separate small details clearly.

The body tube—through which light passes from the objective to the ocular lens.

The ocular lenses (eyepieces)—usually a 10X is provided: the number indicates the magnification (in diameters) produced by the ocular of the image formed by the objectives. Magnification is determined by the ratio between the size of the virtual image and the real size of the object. It is expressed in diameter multiples, for example, 100X. By multiplying the magnification engraved on the objective by that engraved on the eyepiece, one can determine the total magnification. The total magnification resulting from the systems of lenses is determined by the combination of objectives and oculars:

Objective lens	Color Code	10X Ocular	Total Magnification
15 mm-10X	green	10X	100X
4 mm-43X	yellow	10X	430X
1.8 mm-95X	red	10X	950X

4. Adjustment System (composed of two parts, both of which raise or lower the body tube together with the lens system):

Coarse adjustment—made by rotating the control knob until the image appears and is in approximate focus.

Fine adjustment—made after the coarse adjustment by rotating the control knob; it renders the image clear and well-defined.

Use of Microscope

Adjustment of Light. Good definition at high magnification is necessary for bacteria microscopy and is impossible to attain unless adequate lighting is used. Generally two types of illuminators or lamps are available: one that has no lenses to concentrate its light, referred to as an illuminated surface type lamp, and one that has condensing lenses and an iris diaphragm (fig. 6-3).

For the illuminated surface type lamp, the following method should be used:

1. Place the specimen (slide) on the stage over the center of the opening in the stage.

2. Place lowest power objective a short distance above the specimen.

3. Use the flat mirror surface to light field of view. Use coarse adjustment to bring image into approximate focus.

4. Remove ocular (eyepiece) and open or close iris diaphragm of Abbe condenser so that the back lens of the objective is filled with light. Focus condenser up and down until the objective is as uniformly filled with light as possible.

5. Replace ocular. If field is not fully lighted, moving the lamp nearer to or farther from the mirror may help.

For a lamp with condensing lenses and iris diaphragm, the following method should be used for light adjustment:

1. Remove all filters.
2. Place the illuminator (lamp) 8 to 10 inches in front of the microscope and adjust so that the light falls on the center of the mirror.
3. Focus the lamp condensing lens so that the filament (of the lamp bulb) image is focused on the closed iris diaphragm of the Abbe condenser. The image of the filament on the iris diaphragm of the Abbe condenser may be seen in the microscope mirror. Sometimes a piece of white paper held over the iris diaphragm of the microscope will aid in seeing the filament.
4. Place specimen on the stage and with the coarse adjustment obtain approximate focus on the specimen. Adjust the iris of the illuminator by raising or lowering the Abbe condenser so that the field of view is evenly filled with light.

5. Remove the ocular and adjust the iris diaphragm of the Abbe condenser so that the back lens of the objective is filled with light.

6. If the light is too intense for comfortable observation, insert neutral filters to reduce it. The light from a filament lamp is yellow and is made whiter by absorbing some of the excess red by means of a blue glass filter.

Focusing. The process of focusing consists of adjusting the relation between the optical system of the microscope and the object to be examined so that a clear image of the object is obtained. The distance between the upper surface of a glass slide on the microscope stage and the faces of the objective lens varies according to which of the three objectives is in focusing position. Thus, the intervening distance with the low-power objective (10X) is the greatest (16 mm), that for the oil-immersion lens (95X) is the smallest (1.8 mm), and that for the high-dry objective (43X) is intermediate (4 mm). As a result, the focusing operation must be conducted with skill to avoid damage to the objective lens, the specimen, or both. It is good practice to obtain a focus with the low-power objective first, then change to the higher objective required. Most modern microscopes are equipped with parfocal objectives, which means that if one objective is in focus, the others will be in approximate focus when the nosepiece is revolved. With the low-power objective in focusing position, the following steps in focusing should be observed.

1. Seated behind the microscope, lower your head to one side of the microscope until your eyes are approximately at the level of the stage.

2. Using the coarse adjustment, lower the body tube until the face of the objective is within ¼ inch of the object. Most microscopes are constructed in such a manner that the low-power (green) objective cannot be lowered to make contact with the object on the stage.

3. While looking through the ocular, use the coarse adjustment to elevate the body tube until the image becomes visible. Then use the fine adjustment to obtain a clear and distinct image. Do not move the focusing knob while changing lenses.

4. If the high-dry objective (yellow) is to be used next, it is brought into position by revolving the nosepiece (a distinct "click" indicates it is in proper alignment with the body tube). The fine adjustment is used only to bring the object into exact focus. Of course, light adjustment must be made; the iris diaphragm of the condenser should be opened to accommodate more light.

5. The oil-immersion objective (red) is used for detailed study of stained bacterial smears. Remember that the distance between objective lens and object is very short, and great care must be employed. After focusing with the high-dry objective and scanning for well defined cells, raise the objective, place a small drop of immersion oil, free of bubbles, on the slide, centering the drop in the circle of light coming through the condenser. Next, revolve the nosepiece to bring the oil-immersion objective into place, and by means of the coarse adjustment slowly lower the body tube until the lens just makes contact with the drop of oil on the slide. The instant of contact is indicated by a flash of light illuminating the oil. The final step in focusing is done with the fine adjustment. It is with this lens in particular that lighting is important; the final focus, clear and well-defined, will be obtained only when proper light adjustment is made.

Care of the Microscope

The microscope is an expensive and delicate instrument that should be given proper care.

Moving or transporting the microscope should be done by grasping the arm of the scope in one hand and supporting the weight of the scope with the other hand. Sudden jolts and jars should be avoided.

The microscope should be kept clean at all times; when not in use, it should be enclosed in a dustproof cover or stored in its case. Dust should be removed with a camel hair brush. Lenses should be wiped carefully with lens tissue.

When the oil immersion lens is not being used, the oil should be removed with lens tissue.

Oil solvents, such as xylol, should be used on lenses only when required to remove dried oil and only in the minimal amount necessary. Alcohol or similiar solvent must never be used to clean lenses.

COMPLETE BLOOD COUNT

The complete blood count consists of:

- Total red blood cell count (RBC)
- Hemoglobin determination
- Hematocrit reading
- Total white blood cell count (WBC)
- Differential white blood cell count

Red Blood Cell Count
(Erythrocyte Count)

The red blood cell count is made to determine the number of red cells in one cubic millimeter (mm^3) of blood. The normal red blood cell count is:

adult male 5.4 ± .8 million/mm^3
adult female 4.8 ± .6 million/mm^3
newborn 5.1 ± .9 million/mm^3

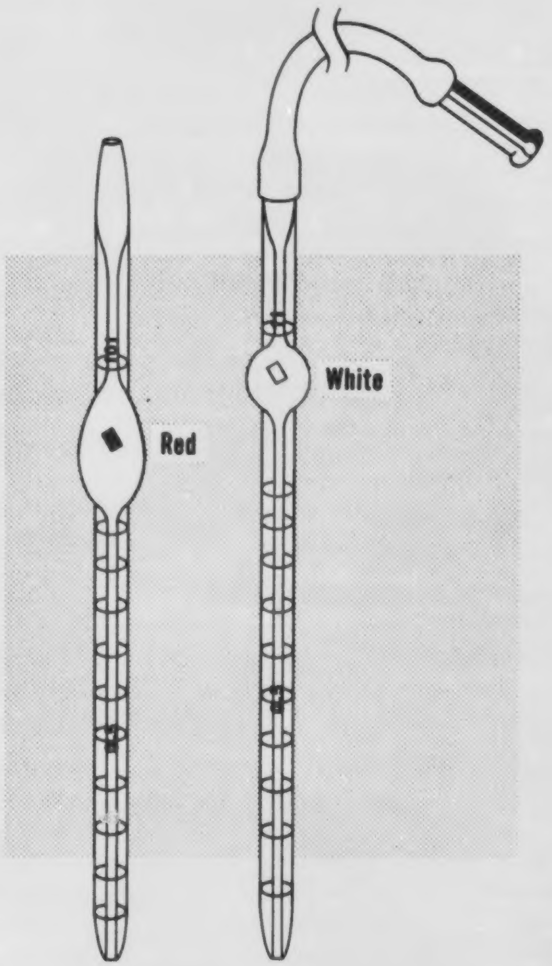
A lower count is usually a sign of anemia.

Materials Required

- Hemacytometer set
- Microscope with lamp
- Red cell pipette
- Suction tube
- Laboratory chits
- Red cell diluting fluid. Gowers' solution is best because it preserves the shape of the cells and prevents agglutination. In addition, it destroys the white cells. To prepare this solution, dissolve 33.3 ml of glacial acetic acid in 200 ml of distilled water. POUR ACID INTO WATER. Stir in 12.5 g of sodium sulfate until dissolved. Filter before use.
- Hand held counter

Procedure

1. Using well mixed anticoagulated blood or blood directly from a fingerstick, fill the clean, dry, red cell pipette (fig. 6-4) exactly to the 0.5 mark with the aid of the suction tube. Hold the pipette in a nearly horizontal position so that the exact level of the blood can be seen. The curve of the tip may rest on the skin, but the orifice must be free to immerse in the drop of blood to avoid air bubbles. If the blood level



159.5

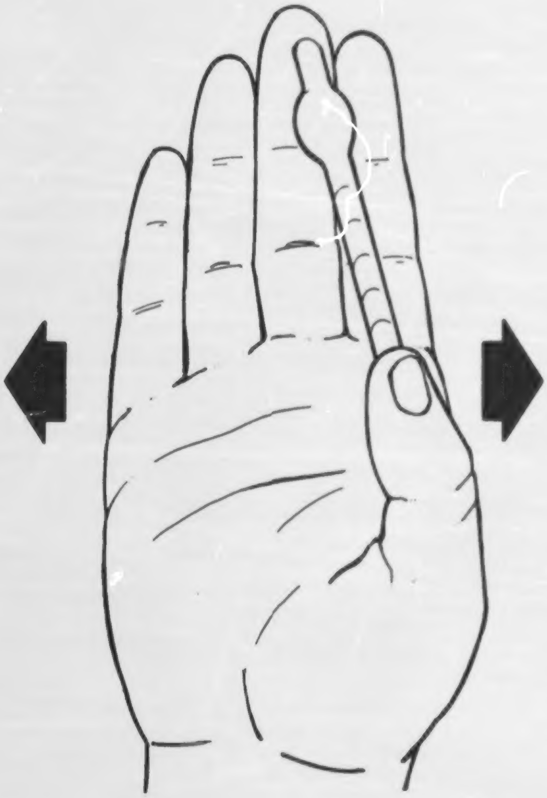
Figure 6-4.—Blood Cell Pipettes.

exceeds the 0.5 mark, withdraw excess blood by touching the tip to the skin surface. Do not touch it to gauze or cotton since these materials absorb the fluid portion of the blood, leaving behind a much higher concentration of cells.

2. Wipe the blood from the outside of the pipette, taking care not to touch the very tip. Immerse the tip in the RBC diluting fluid and aspirate fluid exactly to the 101 mark, slightly rotating the pipette while doing so. It is best to hold the pipette in an almost vertical position to avoid formation of air bubbles in the bulb. DO NOT DELAY BETWEEN STEPS 1 AND 2. IF THE BLOOD IS NOT DILUTED PROMPTLY, IT WILL DRY IN THE PIPETTE. Start to draw diluting fluid into the pipette as soon as the tip of the pipette is immersed in fluid to avoid loss of blood cells. Wipe the excess diluting fluid from the pipette, taking care not to touch the very tip. Filter the diluting fluid regularly to remove accidentally introduced blood cells.

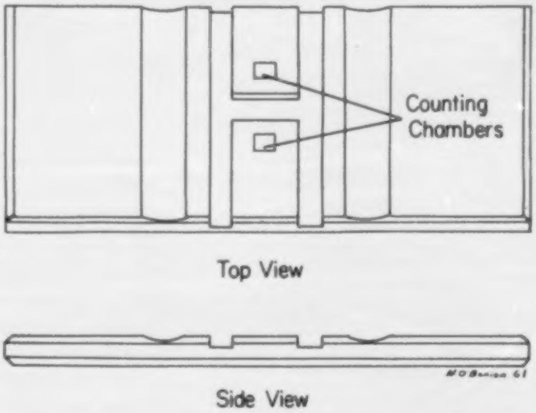
3. Remove the suction tube and shake the pipette vigorously for 3 minutes. DO NOT SHAKE IN THE DIRECTION OF THE LONG AXIS. (See fig. 6-5.)

4. Discard the clear fluid (about three drops) from the stem of the pipette. The counting chamber (fig.6-6) must be loaded with fluid from the pipette's bulb.



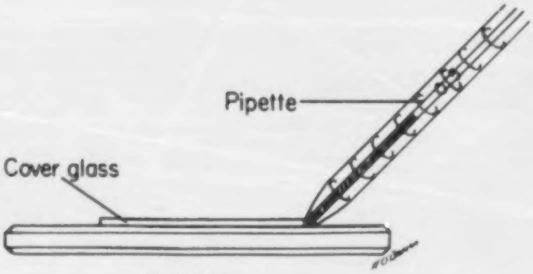
159.6

Figure 6-5.—Mixing Blood and Diluting Fluid.



159.7

Figure 6-6.—Hemacytometer Counting Chamber.



THIS IS THE CORRECT POSITION OF PIPETTE FOR PROPER LOADING OF THE COUNTING CHAMBER. THE PIPETTE TOUCHED BOTH GLASS AND SURFACE OF HEMACYTOMETER.

159.8

Figure 6-7.—Loading the Counting Chambers.

5. Place the coverglass on the counting chamber, making sure both are clean and grease-free. (Fingerprints must be completely removed.) Load the counting chamber by touching the tip of the pipette against the edge of the coverglass and the surface of the counting chamber (fig. 6-7). A properly loaded counting chamber should have a thin, even film of fluid under the coverglass. Allow 3 minutes for cells to settle. If fluid flows into the grooves (moats) at the edges of the chamber or if air bubbles are seen in the field, the chamber is flooded and must be cleaned with distilled water, dried with lens tissue, and reloaded.

6. Place the hemacytometer (fig. 6-8) on the microscope. Use the low-power lens to locate the five small fields (1, 2, 3, 4, and 5) in the large center square bounded by the double or triple lines. Each field measures 1/25 mm^2, 1/10 mm in depth, and is divided into 16 smaller squares. These smaller squares form a grid that makes accurate counting possible.

7. Switch to the high-dry lens and count the number of cells in field 1. Move the hemacytometer until field 2 is in focus and repeat the counting procedure. Continue until the cells in all five fields have been counted. Note that the fields are numbered clockwise around the chamber, field 5 being in the center. Count the fields in this order. To count the cells in each field, start in the upper left small square and follow the pattern indicated by the arrow in figure 6-8. Count all of the cells within each square, including the cells touching the lines at the top and on the left. DO NOT COUNT ANY OF THE CELLS TOUCHING THE LINES ON THE RIGHT AND AT THE BOTTOM.

8. Total the number of cells counted in all five fields and multiply by 10,000 to arrive at the number of red cells per cubic millimeter of blood. The number of cells counted in each field should not vary by more than 20. A greater variation may indicate poor distribution of the cells in the fluid resulting in an inaccurate count.

9. Immediately after completing the count, clean the counting chambers with distilled water and dry it with lens tissue. Rinse pipettes first with cold water, then with acetone. Let air be drawn through the pipette until it is dry. The pellet should move freely in the bulb if the pipette is dry.

Some common sources of error are:

- Improper dilution—not drawing blood exactly to the 0.5 mark or using too much diluting fluid
- Dirty equipment—diluting fluid unfiltered; greasy glassware; dirty microscope; wet pipettes
- Poor mixing or not discarding first few drops of fluid
- Poorly loaded counting chamber
- Chipped pipettes. Discard pipettes with chipped or broken tips.
- Use of gauze, cotton, or filter paper to remove excess blood from the pipette.

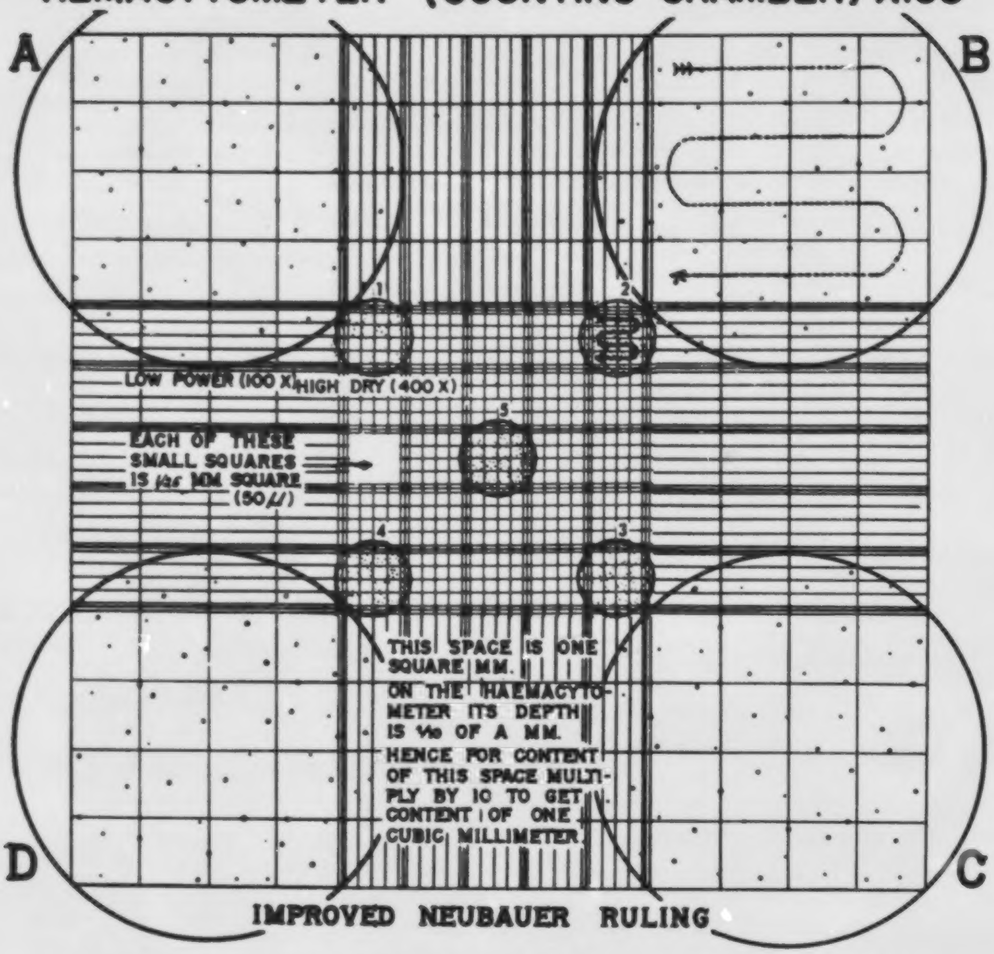
Hemoglobin Determination

Of the many methods of hemoglobin estimation, the most accurate is reading of hemoglobin as oxyhemoglobin in the photometer, after dilution of the blood with a weak alkali. The Haden-Hausser, Sahli-Hellige, and Newcomer tests, based on acid hematin formed by the action of hydrochloric acid on hemoglobin, are sufficiently accurate for routine examination, provided they are properly done. Since relatively few ships and stations are equipped with photometers, we will discuss the Sahli-Hellige method.

Materials Required for Sahli-Hellige Test

- Distilled water
- Sahli-Hellige hemoglobinometer kit containing:
    - Small bottle of dilute (approx. 0.1N) hydrochloric acid. Prepare this solution by adding 1 ml of concentrated HCl to 99 ml of distilled water. POUR ACID INTO WATER. Replenish this periodically—it must be of proper strength.
    - Graduated tube, with a scale on two sides. On one side is the percentage scale, and on the opposite side is the gram scale. The percentage scale reads from 0 to 170. The gram scale reads from 0 to 24.

HEMACYTOMETER (COUNTING CHAMBER) X193


A
B
C
D
1
2
3
4
5
LOW POWER (100 X)
HIGH DRY (400 X)
EACH OF THESE SMALL SQUARES IS 1/25 MM SQUARE (50μ)

THIS SPACE IS ONE SQUARE MM. ON THE HAEMACYTOMETER ITS DEPTH IS 1/10 OF A MM. HENCE FOR CONTENT OF THIS SPACE MULTIPLY BY 10 TO GET CONTENT OF ONE CUBIC MILLIMETER.

IMPROVED NEUBAUER RULING

A - B - C - D ARE FIELDS USED IN DOING THE WHITE BLOOD CELL COUNT.

1 - 2 - 3 - 4 - 5 ARE FIELDS FOR RED CELL COUNT.

LETTERS, NUMBERS, AND ARROWS ARE NOT ACTUALLY SEEN IN THE COUNTING CHAMBER. THEY ARE FOR ILLUSTRATION.

CIRCLES DEPICT AREA SEEN THROUGH THE MICROSCOPE.

159.9

Figure 6-8.—Counting Chambers.

- Pipette, marked at the 20 mm³ level
- Stirring rod
- Color comparator, with a window in the side. On the right and left sides of this opening is the color standard for comparison. The center has an open slot to hold the graduated tube.

Technique

1. With a medicine dropper, place five drops of the 0.1N HCL in the bottom of the graduated tube. Place tube in color comparator.

2. Using well-mixed venous blood or fingertip blood, fill pipette to the 20 mm³ mark.

3. Wipe blood from the outside of the pipette. Transfer blood to Sahli tube. Note time.

4. Aspirate distilled water into pipette two or three times and transfer these washings to tube.

5. Shake until blood is well mixed and the tube is a uniform color.

6. Add distilled water, drop by drop, each time mixing the solution with the stirring rod. Keep adding water and mixing until the color of the solution matches the standards on either side. Remove stirring rod from the tube each time before comparing. Natural light makes more accurate readings possible.

7. Five minutes after time is noted, read the result from the scale on the tube by noting the graduation mark at the lower edge of the meniscus. Read and report both scales.

Reporting. Findings are reported both in grams per 100 ml of whole blood and in percentages of normal values. There are a number of modifications of the Sahli-Hellige method, and 100% may be equal to from 13.8 g to 17.3 g. In the sets usually used in the Navy, however, 100% is equal to 14.5 g of hemoglobin per 100 ml of whole blood. After reading the percentage on the scale, turn the tube and read from the other side to get the equivalent reading in grams.

If either scale is hard to read, remember that 100% - 14.5 g = 6.9, so 1 g of hemoglobin is equal to 6.9%. If only one scale can be read, the other reading can be computed.

Caution: Equipment must be clean and dry before determination is started. Wipe all blood from the outside of the pipette before you insert it into the tube. Twenty cubic millimeters is a small volume, and a few blood cells clinging to the outside of the pipette can cause a significant error in findings.

Hematocrit (Packed Cell Volume) Determination

Hematocrit is the volume of erythrocytes expressed as a percentage of the volume of whole blood in a sample. The venous hematocrit agrees closely with the hematocrit obtained from a skin puncture; both are greater than the total body hematocrit. Dried heparin, balanced oxalate, or EDTA is satisfactory as an anticoagulant.

The microhematocrit method is not available at all duty stations. However, it is the most accurate means of determining blood volume and should be used whenever feasible. This test is rapidly replacing the red cell count for general purposes since it is easier, quicker, and more accurate. The method described here is the microhematocrit method.

Normal Values. The normal hematocrit for males is 42% to 50%, for females 40% to 48%. A value below an individual's normal range for sex and age indicates anemia.

Materials Required

- Capillary tubes, plain or heparinized
- Modeling clay sealant or microburner
- Microhematocrit centrifuge
- Microhematocrit reader

Technique

1. Fill the capillary tube two-thirds to three-fourths full with well-mixed, oxalated venous blood or fingertip blood (for fingertip blood use heparinized tubes, and invert several times to mix).

2. Seal one end of the tube with clay or seal empty end of the tube in a small flame of a microburner.

3. Place the filled tube in the microhematocrit centrifuge, with the plugged end away from the center of the centrifuge.

4. Centrifuge at preset speed of 10,000 to 12,000 G. for 5 minutes. If the hematocrit exceeds 50%, centrifuge for an additional 5 minutes.

5. Place tube in the microhematocrit reader. Read the hematocrit by following the manufacturer's instructions on the microhematocrit reading device.

White Blood Cell (Leukocyte) Count

The total white cell count determines the number of white cells per cubic millimeter of blood. A great deal of information can be derived from white cell studies. The white cell count and the differential count have been common laboratory tests and almost a necessity in determining the nature and severity of systemic infections.

Normal Values. The normal range is 4,500 to 11,000 cells per cubic millimeter of whole blood.

Abnormal White Blood Cell Count

1. Leukocytosis (abnormally high count). This may be caused by:

a. Systemic or local infections (usually due to bacteria). These counts are highly variable and not diagnostic. Some infections and representative white cell counts are:

(1) pneumonia—20,000 to 30,000

(2) meningitis—20,000 to 30,000

(3) appendicitis—10,000 to 30,000

b. Dyscrasia of blood-forming tissues. This is not caused by any known bacteria, but is due to malfunctioning of the marrow and lymph tissues, resulting in extremely high white cell counts, which sometimes exceed 1,000,000. This is commonly known as leukemia, or blood cancer.

c. Physiologic conditions, with counts running as high as 15,000. Some of these may occur as follows:

(1) in the newborn

(2) during late pregnancy

(3) during labor

(4) accompanying severe pain

(5) after exercise or meals

(6) after cold baths

(7) during a severe emotional upset.

2. Leukopenia (abnormally low count). This may be caused by:

a. Bacterial infections, such as typhoid, paratyphoid, and sometimes tularemia. When typhoid is ushered in by bronchitis, moderate leukocytosis may occur at first.

b. Infections caused by viruses and rickettsiae, such as measles, rubella, smallpox (until the 4th day), infectious hepatitis, psittacosis, dengue, tsutsugamushi fever, and influenza (when it may fall to 1,500 or shift to leukocytosis if complications develop).

c. Protozoal infections (such as malaria) and helminthic infections (such as trichinosis). In malaria slight leukocytosis may develop for a short time during paroxysm, but shortly after its onset leukopenia ensues. With trichinosis there may be leukocytosis with an increase in eosinophils (as high as 50% to 70%).

d. Overwhelming infections when the body's defense mechanism breaks down.

e. Anaphylactic shock.

f. Radiation.

Materials Required for White Blood Cell Count

- Hemacytometer set
- Microscope with lamp
- White cell pipette
- Suction tube
- Laboratory chits
- White cell diluting fluid. This may be either of two acids. The acid ruptures the red cells, leaving the white cells intact. These acids are:
  - Dilute hydrochloric acid. Prepare this by mixing 1 ml of concentrated hydrochloric acid with 99 ml of distilled water. POUR ACID INTO WATER.
  - Glacial acetic acid 2 ml
    1% aqueous solution of gentian violet 1 ml
    Distilled water 97 ml

The gentian violet is not necessary, but by staining the nucleus it makes the cells more refractile and helps to make an accurate count.

- Four plain glass slides to prepare smears for differential count.
- Hand held counter

Technique

1. Draw well-mixed oxalated venous blood or fingertip blood to the 0.5 mark on white cell pipette.

2. Observing the same precautions as for red cell count, draw diluting fluid to the 11.0 mark.

3. Shake the pipette for 3 minutes. Do not shake on long axis. (See fig. 6-5.)

4. Load the counting chamber, using the same technique as for red cell count.

5. Count the white cells with low-power lens in each of the four large corner fields (A, B, C, and D in fig. 6-8). Use subdued lighting. Go clockwise around the counting chamber; that is, from field A to field B to field C to field D. For convenience each field is divided into 16 smaller squares. Starting with the small squares in the upper left corner of the field, count the cells in each square in the top row, moving across the field to the right, then drop down one row of squares and work back to the left, as indicated by the arrow. Remember the rule for counting cells: COUNT THE CELLS TOUCHING THE BORDER LINES AT THE TOP AND ON THE LEFT. DO NOT COUNT THE CELLS TOUCHING THE LINES ON THE RIGHT AND AT THE BOTTOM.

6. When all the cells in the four fields have been counted, multiply the count by 50 for the total white cell count.

7. Immediately after completing the count, clean the counting chamber with distilled water and dry it with lens tissue. Rinse pipettes first with cold water, then with acetone. Let air be drawn through the pipette until it is dry. The pellet should move freely in the bulb if the pipette is dry.

Sources of Error. The errors are generally caused by the same mistakes as described for red cell counts.

Differential White Blood Cell (Leukocyte) Count

The total white cell count is not necessarily indicative of the severity of a disease, since some serious ailments may show a low white cell count. However, the percentage distribution of the different types of leukocytes in the blood often provides more helpful information in determining the severity and extent of the infection than any other single procedure used in the examination of the blood. The differential count gives these percentages.

Normal Values. The normal percentages of the different leukocytes are:

● Eosinophils	(Eos)	0%-3%
● Basophils	(Basos)	0%-1%
● Lymphocytes	(Lymphs)	20%-30%
● Monocytes	(Monos)	0%-8%
● Neutrophils	(Neuts)	
● Metamyelocyte	(Meta)	0%-1%
● Bands	(Bands)	0%-5%
● Segmented	(Segs)	56%-62%

Most hospital corpsmen have heard the expressions "shift to the left" and "shift to the right." These terms are often loosely used in referring to an increase in bands or an increase in segmented neutrophils respectively. The true meaning of the terms can best be explained by the following diagram:

Percentage Distribution of the Different Leukocytes

	Meta	Bands	Segs	Eos	Basos	Lymphs	Monos
Normal %	0-1	0-5	56-62	0-3	0-1	20-30	0-8

The metamyelocytes, bands, and segmented neutrophils constitute the neutrophilic cells. When the cells to the left of the double line are increased, it is a "shift to the left." If the segmented neutrophils increase, it is a "shift to the right." The true "right shift" will show numerous hypersegmented (having six or more lobes) neutrophils.

General Interpretations of Leukocytic Changes

- The severity of an infection may be determined by the total white cell count and the differential count.

- Leukocytosis (abnormally high white cell count) with an increase in the percentage of neutrophils indicates a severe infection with a good response of the bone marrow. The primary phagocytes (bacteria-destroying cells) are the neutrophils, and the bone marrow should supply large numbers of these to combat the infection. The greater the "shift to the left" (increase in immature neutrophils), the more severe the infection. The appearance of numerous juvenile cells (metamyelocytes) indicates irritation of the bone marrow with regeneration. If the infection continues and the patient's resistance declines, the shift advances further to the left. If improvement ensues, the shift declines and recedes to normal.

- A falling white cell count with the number and maturity of neutrophils progressing toward normal indicates recovery.

- A continued "shift to the left" with a falling total white cell count indicates a breakdown of the body's defense mechanism and is a poor prognosis.

- The percentage of eosinophils, lymphocytes, and monocytes generally decreases in acute infections.

- In tuberculosis an increase in monocytes (monocytosis) indicates activity in the infected area. An increase in lymphocytes (lymphocytosis) indicates healing.

- Eosinophils increase in helminthic infections and allergenic conditions.

Materials Required for Differential Count

- Four plain glass microscope slides, clean and dry.

- Wright's stain, powder or tablet form. Prepare this stain as follows.

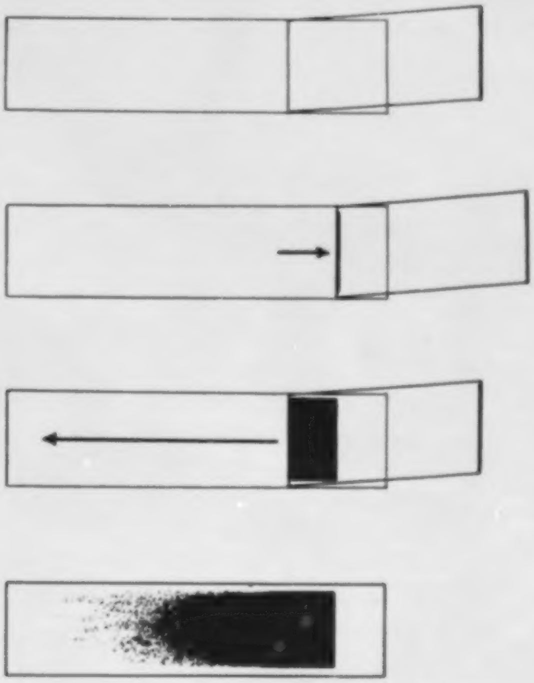
  - Tablets: Use one tablet for each 10 ml of reagent grade methyl alcohol. Dissolve tablets with the aid of trituration in a clean, dry mortar. Pour solution in a stopper bottle and store for 30 days in a dark place, shaking it periodically during this period. Filter before use. Fill dropper bottle for use at lab bench.

  - Powder (preferred): Use 0.1 g of powder for each 60 ml of reagent grade methyl alcohol. Prepare in same manner as tablets. Fill dropper bottle.

- Buffering solution. This may be either:
  - Distilled water with a pH of 7. Use from dropper bottle.
  - A prepared buffer solution with a pH of 6.4. Prepare this by dissolving 6.63 g of monobasic potassium phosphate and 3.20 g of dibasic sodium phosphate in 1,000 ml of distilled water.
- Staining rack.
- Mouthpiece and tube as used in blood counting pipettes.
- Microscope and lamp.
- Immersion oil.
- Cell counter.

Technique for Making Smears

1. Cleanse finger with 70% isopropyl alcohol and puncture it as described previously.
2. Wipe off first drop of blood with dry, sterile gauze.
3. When second drop forms, touch it lightly with a clean, grease-free slide. Place slide on flat surface with drop of blood up. A smear can also be made with a drop of blood from a needle or collecting tube.
4. Hold second slide between thumb and forefinger and place edge at a 45° angle against top of slide holding drop of blood. Back the second slide down until it touches the drop of blood. The blood will distribute itself along the edge of the slide in a formed angle.
5. Push the second slide along the surface of the other slide, drawing the blood across the surface in a thin, even smear. If this is done with uniform rapidity and without wobbling the slide, a good smear will result. Try to keep the blood from reaching the extreme edges of the slides. Large cells have a tendency to stack up on the perimeter of the smear, and letting the smear reach the edges of the slide will aggravate this tendency. The smear should show no wavy or blank spots (see fig. 6-9).
6. Let smear air-dry.



159.10

Figure 6-9.—Making a Blood Smear.

Technique for Staining Smears

1. Place smear on staining rack. Flood it with about 1 ml of Wright's stain and allow it to stand for 2 minutes.

2. Add an equal quantity of buffer. There should be no run-off of fluid from the slide. A little experimentation will show just how much stain and buffer the slide will hold. Mix buffer and stain by blowing air through the rubber pipette tube and directing the current of air about the surface of the slide. Mix until a metallic (coppery looking) film appears. Let stand for 3 minutes.

3. Wash with tap water, provided pH testing has shown the water to be neutral. If the tap water is not neutral, wash the slide with distilled water. The stain and the metallic film must be floated off to prevent streaking, so keep the

slide flat and horizontal in the stream of wash water. If the slide is tilted, the metallic film will settle to the surface of the smear and remain there.

4. Wipe stain from the bottom of the slide. Let it air-dry. A good smear should be thin and evenly distributed, and it must be dry before staining. Always make at least two smears for each patient, as the additional smear should be examined to verify any abnormal findings.

Staining times will vary with different batches of Wright's stain. One batch may give best results with 3 minutes of staining and 2 minutes of buffering, another may give better results with 2 minutes of staining and 3 minutes of buffering. The only way to determine the best time interval for a particular batch of stain is by experimentation.

Next to incorrect time intervals, the most common cause of poor results with Wright's stain is incorrect pH of staining fluid. If the stain is too acid, the red cells in the smear will stain a bright pink or may even be colorless, while an alkaline stain will cause the red cells to appear blue-gray, with poor color definition. In either case, the pH of the buffering solution should be checked.

Technique for Differential Count

1. Place the stained slide on microscope with a drop of immersion oil and adjust oculars.

2. Using oil-immersion lens (red) (highest power), scan fields for areas where the red cells just begin to touch. In this area the blood smear is thinner, and consequently the white cells are easier to identify.

3. Count one hundred consecutive white cells (see fig. 6-10 for identification), pressing the correct key on the cell counter for each type of white cell identified.

4. If you counted 20 lymphocytes among the 100 cells, then the patient has 20% lymphocytes. This is true of any types of cells counted. If an absolute count has been requested, the total leukocyte count is multiplied by individual percentages. Example:

> Patient has a white count of 8,000.
> Differential count shows 20% lymphocytes.
> 20% x 8,000 = 1,600.

The patient has 1,600 lymphocytes per cubic millimeter of blood.

Cell Identification

The ability to identify the different types of white cells is not difficult to develop, but it does require a thorough knowledge of staining characteristics and morphology that can be gained only by extensive, supervised practice. The beginner is likely to encounter some difficulty in learning to differentiate between monocytes and large lymphocytes, or between monocytes and atypical (not typical) lymphocytes. It is possible also to confuse eosinophils with basophils, since an alkaline stain may cause the granulations in an eosinophil to appear deep blue or purple. If this happens, the reddish cast in the granules can often be detected by judicious use of the minor focusing knob. Also, the granulations of an eosinophil are generally much finer than those of a basophil, and they tend to concentrate in the cytoplasm. The neutrophils are subclassified according to age, and the age is indicated by the nucleus. If there is any doubt as to the identity of the neutrophil, always classify it with the older order. For instance, if a single irregularity in a horseshoe-shaped nucleus appears as a break or a concentration of color, classify it as a segmented neutrophil, not as a neutrophilic band. Practice is the key. And remember—even experienced technicians often disagree as to the identity of a particular cell.

If it is desirable to save a smear for reexamination, remove the immersion oil by placing a piece of lens tissue over the slide and moistening the tissue with xylol. Draw the damp tissue across the slide and dry the smear with another piece of lens paper.

A good smear (thin and evenly distributed) is essential for accurate identification and counting.

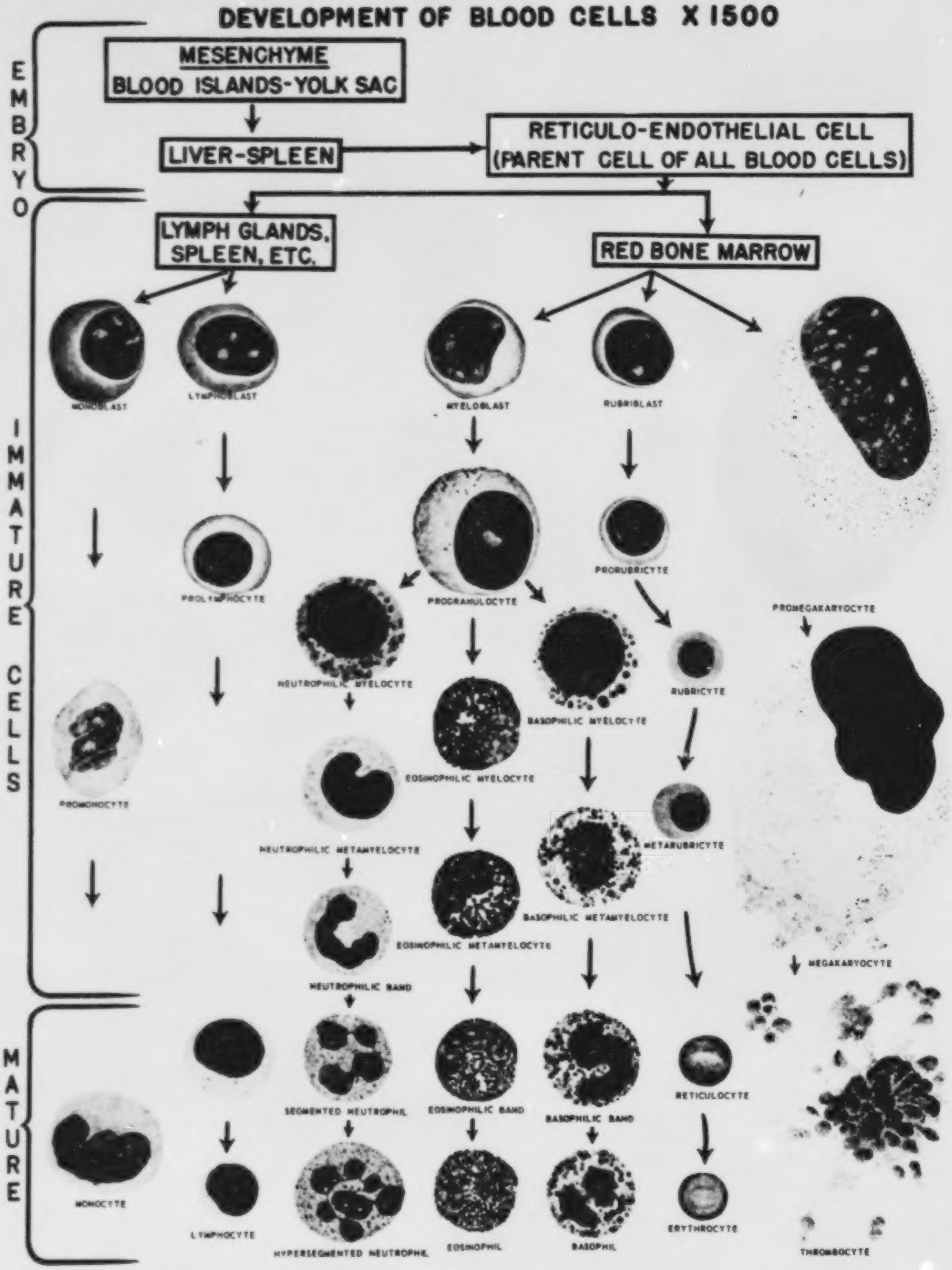

DEVELOPMENT OF BLOOD CELLS X 1500
EMBRYO
MESENCHYME
BLOOD ISLANDS-YOLK SAC
LIVER-SPLEEN
RETICULO-ENDOTHELIAL CELL
(PARENT CELL OF ALL BLOOD CELLS)
LYMPH GLANDS, SPLEEN, ETC.
RED BONE MARROW
IMMATURE CELLS
MONOBLAST
LYMPHOBLAST
MYELOBLAST
RUBRIBLAST
PROLYMPHOCYTE
PROGRANULOCYTE
PRORUBRICYTE
PROMEGAKARYOCYTE
NEUTROPHILIC MYELOCYTE
BASOPHILIC MYELOCYTE
RUBRICYTE
PROMONOCYTE
EOSINOPHILIC MYELOCYTE
NEUTROPHILIC METAMYELOCYTE
METARUBRICYTE
BASOPHILIC METAMYELOCYTE
EOSINOPHILIC METAMYELOCYTE
MEGAKARYOCYTE
NEUTROPHILIC BAND
MATURE
SEGMENTED NEUTROPHIL
EOSINOPHILIC BAND
BASOPHILIC BAND
RETICULOCYTE
MONOCYTE
LYMPHOCYTE
HYPERSEGMENTED NEUTROPHIL
EOSINOPHIL
BASOPHIL
ERYTHROCYTE
THROMBOCYTE

Figure 6-10.—Development of Blood Cells. 154.174

The cytoplasm of an eosinophil contains numerous coarse, reddish-brown granules, which are lighter colored than the nucleus.

Scattered large, dark-blue granules, which are darker than the nucleus, characterize the cell as a basophil. Granules may overlay the nucleus as well as the cytoplasm.

The cytoplasm of a lymphocyte is sky blue, scanty, with few, unevenly distributed, azurophilic granules with a halo around them. The nucleus is generally round or oval or slightly indented, and the chromatin is lumpy and condensed at the periphery.

The largest of the normal white blood cells is the monocyte. Its color resembles that of a lymphocyte, but its cytoplasm is a muddy slate blue. The nucleus is lobulated, deeply indented or horseshoe-shaped, but occasionally the cytoplasm is more abundant than in the lymphocyte.

The cytoplasm of a neutrophil has numerous fine, lilac-colored granules, which sometimes are hardly visible. The nucleus is dark purple or reddish purple, and it may be oval, horseshoe- or S-shaped, or segmented (lobulated). The neutrophil is further subclassified according to age as:

a. Metamyelocyte (also called "juvenile"). This is the youngest neutrophil generally reported. The nucleus is fat, indented, and is usually "bean" shaped or "cashew nut" shaped.

b. Band (sometimes called stab). This is the older or intermediate neutrophil. The nucleus has started to elongate and has curved itself into a horseshoe- or S-shape. As the band ages, it progresses to:

c. Segmented. The nucleus is separated into two, three, four, or five segments or lobes.

d. Hypersegmented. The nucleus is divided into six or more segments or lobes.

URINALYSIS

The physical and chemical properties of normal urine are markedly constant; any abnormalities are easily detected. The use of simple tests provides the physician with helpful information concerning the diagnosis and management of many diseases.

This section will deal with the routine and microscopic examination of urine specimens, some the principles involved, and some of the simpler interpretations of the findings.

Specimens

Urine specimens for routine examinations must be collected in aseptically clean containers. Unless circumstances warrant, catheterization should be avoided because it may cause urinary tract infections. Specimens of female patients are likely to be contaminated with albumin and blood from menstrual discharge, or with albumin and pus from vaginal discharge. For bacteriologic studies care must be taken to ensure that the external genitalia have been thoroughly cleansed with soap and water. The patient must then void the initial stream of urine into the toilet or a suitable container and the remainder directly into a sterile bottle. All urine specimens should be examined when freshly voided or refrigerated to prevent decomposition of urinary constituents.

Random Specimen

This is a sample of urine voided at any time during the day. It is the least valid specimen, since test results may reflect a particular meal or fluid intake.

Overnight Specimen

This is the first morning specimen of urine voided on rising. It is more reliable than the random specimen, because it is usually concentrated and more likely to reveal abnormalities. If positive results are obtained from the overnight specimen, the physician may order a 24-hour specimen.

Twenty-Four Hour Specimen

This specimen measures the exact output of a specific substance over a 24-hour period. To collect this specimen:

1. Have the patient empty his or her bladder at 0800. Discard this urine.
2. Collect all urine voided during the next 24 hours.
3. At 0800 the following day (end of 24-hour period), instruct patient to empty his or her bladder. Add this urine to the pooled specimen.
4. Refrigerate the urine during the collection period.
5. Preservatives will be added to the first specimen voided according to the types of tests being ordered.

Preservation of Specimens

To delay decomposition, use

1. Refrigeration. All specimens not being examined immediately should be refrigerated.
2. Toluene. Simply add enough toluene to form a thin film on the surface of the specimen. This film will prevent air from reaching the urine. False positives are seldom encountered with this preservative. Remember that the toluene is on the surface, and all test samples must be pipetted from BENEATH the surface.
3. Thymol. A small lump, floating on the surface, will preserve a urine specimen for several days. Enough thymol may dissolve to produce false positives for albumin. Do not use more than 0.1 g of thymol per 100 ml of urine.

Other common preservatives are formaldehyde, boric acid, hydrochloric acid, and chloroform. The preservative used must be identified on the label of the container. If no preservative is used, it should be so stated.

Routine Examination

Volume (For 24-Hour Specimen or When Requested)

The normal daily urine volume for adults ranges from 800 to 2000 ml, averaging about 1,500 ml. The amount of urine excreted in 24 hours varies with fluid intake and the amount of water lost through perspiration, respiration, and bowel activity. Diarrhea or profuse sweating will reduce urinary output; a high protein diet tends to increase it. Daytime urine output is normally two to four times greater than nighttime output.

Color

The normal color of urine varies from straw to light amber. Diluted urines are generally pale; concentrated urines tend to be darker. The terms used to describe the color of urine are:

1. Colorless
2. Light straw
3. Straw
4. Dark straw
5. Light amber
6. Amber
7. Dark amber
8. Red

The color of urine may be changed by the presence of blood, drugs, or diagnostic dyes. Examples are:

1. Red or red-brown (smokey appearance), due to the presence of blood.

2. Yellow or brown (turning greenish with yellow foam when shaken), due to the presence of bile.

3. Olive green to brown-black, caused by phenols.

4. Milky appearance, caused by chyle.

5. Dark orange, due to treatment with Pyridium.

6. Blue-green, due to methylene blue.

Transparency

Urine may be reported as clear, slightly cloudy, cloudy, or very cloudy. Some physicians prefer the term "turbidity" to "transparency," but both terms are acceptable.

Freshly passed urine is usually clear or transparent. In certain conditions it may be cloudy due to the presence of blood, phosphates, crystals, pus, bacteria, etc. A report of transparency is of value only if the specimen is fresh. After standing, all urine becomes cloudy due to decomposition, salts, and the action of bacteria. Upon standing and cooling, all urine specimens will develop a faint cloud composed of mucus, leukocytes, and epithelial cells. This cloud settles to the bottom and is of no significance.

Reaction

Normal urine is slightly acid but will become more alkaline upon standing. The pH ranges from 5.0 to 7.0. The acidity of urine is influenced by many factors, such as a diet high in protein or fat, fasting and starvation, and acid therapy. Alkaline urine may be produced by cystitis, pyelonephritis, and sulfonamide therapy.

It is essential that an alkaline urine be maintained during treatment with sulfonamides, since these compounds are precipitated as crystals in acid solution. The crystals will cause damage to the uriniferous tubules. Sodium bicarbonate is generally used as an alkalizer.

Reaction for pH, protein, glucose, ketones, bilirubin, blood, nitrite, and urobilinogen in urine may be determined by the use of the Multistix and Color Chart (NSN 6505-00-122-2401). This is a specially prepared multitest strip that is simply dipped into the urine specimen and then compared with the color values for the various tests on the accompanying chart. The color chart indicates pH values, and the numerical value should be reported.

Specific Gravity

The specific gravity of the specimen is the weight of the specimen as compared to an equal volume of distilled water. The specific gravity varies directly with the amount of solids dissolved in the urine and normally is from 1.015 to 1.030 during a 24-hour period.

The first morning specimen of urine will have a higher specific gravity than a specimen passed during the day. A high fluid intake may reduce the specific gravity to below 1.010. In disease the specific gravity of a 24-hour specimen may vary from as low as 1.001 to as high as 1.060.

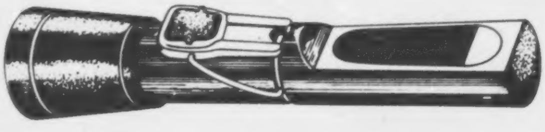
The specific gravity may be measured with the urinometer or the index refractometer, available as standard equipment at most duty stations. The refractometer (NSN 6550-00-933-3218) may be held manually (fig. 6-11) or mounted on a stand like a microscope. The specific gravity is determined by the index of light refraction through the solid material.

Measurement with Urinometer

1. Pour urine into the cylinder until it reaches a point approximately 1½ inches below the top of the cylinder. Insert the urinometer, making sure that it is floating freely. The cylinder should not overflow when the urinometer is immersed. Read the bottom of the meniscus.
2. If the specimen is cloudy, the urine should be centrifuged before specific gravity readings are taken. Cloudy urine tends to show low (and invalid) specific gravity.

Measurement with Index Refractometer

1. Hold the index refractometer in one hand, and with the other hand and two applicator sticks place a drop of urine on the glass section beneath the coverglass.



154.175

Figure 6-11.—Index Refractometer.

2. Hold the refractometer so that the light reflects on the glass section and look into the ocular end. Read the number that appears where the light and dark lines meet. This is the specific gravity.

Glucosuria

Glucosuria is the presence of an abnormal amount of glucose in the urine. Traces of sugar are often found in normal urine; however, different sugars in the urine are of various clinical significance. When performing routine urinalysis, we can test for glucose.

Methods for Measuring Glucose

1. Test Strip, Glucose and Blood (NSN 6505-00-436-1870). This test is specific for glucose. Other sugars do not interfere.

   a. Remove strip from container.

   b. Dip in specimen. Remove and wait 30 seconds.

   c. Immediately compare the test strip against the color chart.

   d. Record results. Normal urine is negative for glucose.

2. Urine-Sugar Test Tablets (Clinitest Tablets) (NSN 6505-00-149-0220).

   a. Place 5 drops of urine in a large test tube.

   b. Add 10 drops of water and mix well.

   c. Add one Clinitest tablet.

   d. Put the tube in a rack. Let stand until the reaction is completed (foaming action has stopped).

   e. Compare the color with the color chart and record the results.

   f. If an orange color appears and then disappears, run the test again, diluted in half.

   g. Be careful not to touch the end of the tube as it is extremely hot.

NOTE: The test for glucose is also conducted with one of the multi-purpose test strips now in common use and available from the Federal Stock Catalog.

Albuminuria

This is the presence of albumin in the urine. Albumin is a protein, consisting of serum albumin and serum globulin that has been eliminated from the blood plasma. It contains carbon, hydrogen, nitrogen, oxygen, and sulfur. Its exact composition has not been determined.

Urinary albumin does not necessarily indicate diseased kidneys; it may reflect reactions to toxic and nontoxic substances originating within the body. Albuminuria is frequently found in young men who have no other signs of disease. This condition is usually transitory. However, albuminuria usually is of clinical significance and generally requires further examination.

Methods for Measuring Albumin in Urine

The test is accomplished by means of test strips. Since practically all urine is tested for both glucose and albumin, the tests are combined in the multitest strips. If the strips are unavailable, the sulfosalicylic acid method of albumin determination may be used.

Sulfosalicylic Acid Method of Albumin Determination

1. If the fresh specimen is clear, the test may be run without centrifuging. If the specimen is cloudy, centrifuge about 15 ml (2,000 rpm for 5 minutes).

2. Pour 2.5 ml of clear urine into a test tube measuring 16 mm x 150 mm.

3. Add 7.5 ml of 3% sulfosalicylic acid to the urine.

4. Mix by inversion and let stand 10 minutes before reading.

5. A white turbidity indicates albuminuria. Compare the specimen with the standards and report as indicated, i.e., 1+, 1.5+, etc.

Caution: The centrifuge is a carefully balanced machine, and efforts should be made to maintain that balance. Specimens should be placed directly opposite each other in the machine. If only one urine specimen is being centrifuged, place a tube containing an equivalent weight of water directly opposite the urine.

Microscopic Examination of Urine Sediment

Usually performed in addition to routine procedures, this examination requires a degree of skill that can be acquired only through practice under the immediate supervision of a competent technician. The specimen should be as fresh as possible, since red cells and many formed solids tend to disintegrate upon standing, particularly if the specimen is warm or alkaline.

Procedure

1. Mix the specimen well.

2. Pour 15 ml of urine into a conical centrifuge tube and centrifuge at 1,500 RPM for 5 minutes.

3. Invert the centrifuge tube and allow all of the excess urine to drain out. DO NOT SHAKE THE TUBE WHILE INVERTED. Enough urine will remain in the tube to resuspend the sediment. Too much urine remaining will cause diluting of the sediment and difficulty in reading.

4. Resuspend the sediment by tapping the bottom of the tube.

5. With a medicine dropper, mount one drop of the suspension on a slide and cover it with a coverslip.

6. Place the slide under the microscope and scan with low-power lens and subdued lighting.

7. Switch to the high-dry lens for detailed examination of a minimum of 10 to 15 fields.

Clinically Significant Findings

LEUKOCYTES. Normally, 0 to 3 leukocytes per high-dry field will be seen on microscopic examination. More than 3 cells per high-dry field probably indicates disease somewhere in the urinary tract. Estimate the number of leukocytes present per high-dry field and report it as the "estimated number per high-dry field."

ERYTHROCYTES. These cells are not usually present in normal urines. If erythrocytes are found, estimate their number per high-dry field and report it. Erythrocytes may be differentiated from white cells in several ways:

- White cells are larger than red cells.

- When focusing in with the high-dry lens, the red cells show a distinct circle; the white cells tend to appear granular and the nucleus may be visible.

- The addition of one drop of 5% acetic acid to the urine sediment will disintegrate any red cells but will not affect the white cells except to make the nuclei more distinct.

CASTS. These urinary sediments are formed by coagulation of albuminous material in the kidney tubules. They are cylindrical and vary in diameter depending on the size of the renal tubule or duct of their origin. The sides are parallel, and the ends are usually rounded. Casts in the urine always indicate some form of kidney disorder and should always be reported. If casts are present in large numbers, the urine is almost sure to be positive for albumin. Casts containing organized structures are:

- RBC casts
- WBC casts
- Tubular epithelial cell casts

Types of casts:

- hyaline
- waxy
- granular
- fatty

CYLINDROIDS. Resemble hyaline casts but are more slender and have a slender tail that is often twisted or curled. They frequently are seen along with hyaline casts and have the same significance.

Other microscopic structures found in urine are:

- various kinds of crystals
- epithelial cells
- mucous threads
- spermatozoa

These are not generally pathologic unless present in very large numbers. Certain types of crystals are pathologic; therefore all crystals seen should be reported.

THE HOSPITAL CORPSMAN AND CLINICAL LABORATORY TECHNIQUES

As mentioned in the beginning of this chapter, hospital corpsmen are required to have a basic knowledge of laboratory procedures. It is not expected that all hospital corpsmen be proficient in all phases of this field, but it is essential that they know how to perform the tests mentioned in this chapter, since they are eligible for duty independent of a medical officer.

The hospital corpsman is not expected to make a diagnosis from the test findings or to institute definitive treatment based upon them; however, with the availability of modern communciation facilities, the results of these tests will greatly assist him or her in giving a clearer clinical picture to the supporting medical officer.

Needless to say, accuracy, neatness, and attention to detail are essential to obtain optimum test results. Remember also that these tests are only aids to diagnosis—many other clinical factors must be taken into consideration before treatment can be started.

Administrative Responsibilities In The Laboratory

The ability to perform clinical laboratory tests is a commendable attribute of the hospital corpsman. However, the entire effort can come to naught if proper recording and filing practices are ignored and the test results go astray.

Since the test results are a part of the patient's clinical picture, their accuracy and veracity is vital. Since they have a bearing upon the immediate and future medical history, they are made part of the medical record. Erroneous and inaccurate lab reports have been known to cause extensive embarrassment and medical complications.

As a hospital corpsman, it is your responsibility to assure effective administration of all laboratory reports in your department and to make sure that they are properly filed.

Patient Identification

When accepting laboratory requests and specimens, make absolutely certain that the patient is adequately identified. Proper identification can prevent a great number of errors.

Specimen Identification

Make sure that the specimen is in fact that of the patient submitting it. You need not stand over the patient while it is being produced; however, keep in mind that there are instances when it would be advantageous for persons to substitute specimens.

Use of Proper Forms

The Armed Forces have gone to great lengths to produce workable and effective laboratory forms to serve their purpose with a minimum of confusion and chance for error. These forms are standard forms of the 500 series. Their primary purpose is to request, report on, and record clinical laboratory tests. With the exception of SF-514, Laboratory Report Sheet, they are multicopy, precarbonized for convenience. The original eventually is filed in the patient's clinical record, and the carbon becomes part of the laboratory's master file. For a complete listing of these forms and their purposes, refer to chapter 23, *Manual of the Medical Department.*

Use of Laboratory Forms

It goes without saying that a separate form is used for each patient and test. The patient's name, rank, social security number, and unit identification will be entered on each request in sufficient detail to assure proper identification.

Since the results of the requested lab test are usually closely associated with the patient's health and treatment, the requesting physician's name and location shall be clearly stated. This assures that the report will get back to the physician as expeditiously as possible. There is nothing more aggravating to both patient and physician than a lost or misplaced laboratory report.

Since the data requested, the date reported, and the time of specimen collection are usually important in support of the clinical picture, these facts should be clearly written on the request in the areas provided for them.

The type of tests requested should be clearly marked to eliminate all misunderstanding.

Filing The Laboratory Requests

After the physician has seen the results of the laboratory tests, the forms must be filed in the clinical record of inpatients. Standard Form 514, the Laboratory Report Sheet, is provided for this. The originals of the test forms are to be stapled on this sheet IN CHRONOLOGICAL ORDER and neatly spaced, as directed on the form. Each sheet will accommodate a certain number of laboratory reports. DO NOT OVERCROWD with more reports—use additional sheets if necessary.

The results of the laboratory tests performed on active duty outpatients will be transcribed to the SF 600 in the Health Record. When this is accomplished, the laboratory report may be destroyed. DO NOT FILE IT IN THE HEALTH RECORD.

Ethics in the Laboratory

The nature of laboratory tests and their results must be treated as a confidential matter between the patient, physician, and the performing technician. It is good practice to prevent unauthorized access to these reports, to leave interpretation of the test results to the attending physician, and to refrain from discussing them with the patient.

CHAPTER 7

PHARMACOLOGY AND TOXICOLOGY

As you advance in rate, you will become more and more involved with the intricacies of administering medicines. Although the drugs and their dosages are prescribed by the medical officer, you as the hospital corpsman are involved in their administration and a thorough knowledge of the basic factors influencing medication is required of you.

THERAPEUTICS

The art of treating disease by any method which will relieve pain, cure disease, or prolong life is called therapeutics. Although the average person thinks solely of giving or taking medicine in this respect, it must be remembered that therapy also includes other methods, such as radiological treatment, diathermy, hydrotherapy, and many more. In this chapter we will concern ourselves primarily with the administration of medicines, their actions, uses, and doses.

MATERIA MEDICA

Although the above term seems to be fading into antiquity, it is still a good one to describe the contents of this chapter. The term implies "medical material" or, to be more precise, the science of substances used in medicine, to wit, the study of drugs. Encompassed within materia medica are many subsciences:

PHARMACOLOGY. The study of the action of drugs and their uses.

PHARMACOGNOSY. The science of crude drugs, their physical, botanical, and chemical properties.

POSOLOGY. The study of a dosage and the criteria which influence it.

METROLOGY. The science of weights and measures.

These are only a few of the many areas which are involved; you will become familiar with more of them as you gain more knowledge and experience.

ADMINISTRATION OF MEDICINES

DOSAGE

The amount of drug to be given is referred to as the dose or dosage. There are a number of dosages with which you must be familiar.

USUAL DOSE. Also referred to as the normal adult dose or average dose. This is the amount of drug required to produce the desired effect, calculated on an average adult about 24 years old, weighing approximately 150 pounds.

RANGE. A term you will see more and more frequently, it applies to the range between the MINIMUM amount of drug and the MAXIMUM amount of drug required to produce the desired effect. A range is necessary due to the many modern drugs, such as antibiotics, which sometimes require large initial doses that are later tapered off to lesser amounts. Closely associated with this term are:

MINIMUM DOSE. The least amount of drug required to produce a therapeutic effect.

MAXIMUM DOSE. The largest amount of drug which can be given without probable toxic effect.

TOXIC DOSE. When using this term, the medical officer means the least amount of drug which will produce the symptoms of poisoning. These symptoms need not be dramatic, but will be sufficient to warrant immediate discontinuance of the medication and institution of remedial measures if necessary.

MINIMUM LETHAL DOSE. The smallest amount of drug that will produce death.

Factors Which Influence Dosage

There are many important factors which determine or influence the amount of drug to be given to a patient. Although the physician prescribes the amount to be given, it will behoove you to know how and why these quantities are determined.

AGE. By far the most common factor which influences the amount of drug to be given is the age of the patient. Obviously the dose for an infant would be much less than that for an adult in the prime of life. It is also interesting to note that the dose varies in old age, either more or less than the average dose, depending upon the action of the drug and the condition of the patient.

The two rules governing calculation of pediatric dosage are Young's Rule and Clark's Rule. Of the two, Clark's Rule provides a better approximation of the dose because it is based on the child's weight, which has a more direct bearing on dosage than does age.

YOUNG'S RULE directs that the age of the person be taken as the numerator of the fraction and the age plus 12 as the denominator.

$$\frac{\text{Age in years}}{\text{Age in years} + 12} \text{ X adult dose} = \text{child's dose}$$

Example: The adult dose of aspirin is 10 grains. What is the dose for a 3 year old child?

$$\frac{3}{3 + 12} = \frac{3}{15} \text{ X } \frac{10}{1} = \frac{30}{15} \text{ or 2 grains}$$

WEIGHT. The weight of the patient is another very important factor which influences the dose of medication. Even in adults, a slight person of less than one hundred pounds would conceivably require less drug than a huge patient weighing well over two hundred pounds. Here again, there is a mathematical formula by which we can determine the dose.

CLARK'S RULE is based on weight in pounds. The weight of the child is used as the numerator of the fraction and the average adult weight, 150 pounds, as the denominator, multiplied by the adult dose:

$$\frac{\text{Weight of child}}{150} \text{ X } \frac{\text{Adult}}{\text{dose}} = \frac{\text{Child's}}{\text{dose}}$$

Example: The adult dose of aspirin is 10 grains. What is the dose for a child weighing 50 pounds?

$$\frac{50}{150} \text{ X } \frac{10}{1} = 3.3 \text{ grains}$$

Weight has become a factor of enough importance that the modern trend is to express dosage in a given quantity per kilogram or pound of total body weight.

OTHER FACTORS WHICH INFLUENCE DOSAGE ARE:

1. Sex. Females usually require smaller doses than males.

2. Race. Negroes usually require larger and Asiatics smaller quantities than Caucasians.

3. Idiosyncrasy. This is a peculiarity of the constitution of individuals to react differently to drugs.

4. Occupation. Persons working out-of-doors at strenuous labor will require larger doses than those who sit at a desk all day.

5. Habitual use. Some patients, due to the type of disease, must take medication over a long period of time, during which time their bodies may build up a tolerance to the drug, consequently requiring larger doses than the initial dose to obtain the desired effect.

6. Time of administration. Some drugs given before meals are more quickly absorbed than those administered on a full stomach.

7. Frequency of administration. It is obvious that the dose of a drug is less if administered frequently than if administered at long intervals.

8. Mode of administration. The manner in which the drug is administered has a very definite bearing on the amount given.

METHODS OF ADMINISTERING DRUGS

Medicinal substances may be introduced into the body systems by various methods, each serving a specific purpose.

ORAL. By far the most common method of administering drugs is by mouth. Since drugs given in this manner need not be absolutely pure or sterile (costly processes in manufacture) this is also the most economical method. Oral medications include liquids, tablets, capsules, and powders. The disadvantages of oral medication are (1) comparatively slow absorption and (2) partial or complete destruction of the drug by the digestive system.

Closely associated with oral medication are dosage forms called SUBLINGUAL and BUCCAL. In these cases, the drug is placed either under the tongue or in the buccal cavity where it dissolves and is absorbed through the mucous membranes directly into the blood stream. These methods are restricted to a select group of drugs and their purposes are primarily to promote rapid absorption and prevent destruction of the drug by the digestive processes.

PARENTERAL. By this we mean administering drugs by injection. All drugs intended for parenteral medication must be pure, sterile and pyrogen-free (pyrogens are products of the growth of microorganisms), and of course, their state must be liquid. There are several specific types of parenteral administration.

Subcutaneous. With this method, the drug is injected under the skin for rapid action and to prevent the drug from being destroyed by the digestive system.

Intradermal. By this method, the drug is injected into the dermis. A common example of this is vaccination.

Intramuscular. The drug is injected into the muscular tissue, usually prolonging the action due to the slower absorption rate of muscular tissue.

Intravenous. By this method, the drug is injected directly into the bloodstream via the vein, and the primary purpose is immediate action. A good example is whole blood or blood plasma transfusion.

Intraspinal. The drug is injected directly into the spinal column, such as in spinal anesthesia.

Hypodermoclysis. By this method, large quantities of fluids are introduced into the "loose" tissue about the torso or thighs. This method is used frequently to replace body fluids in cases of dehydration.

INHALATION. Medication introduced via the respiratory system, either in the form of gas, vapor, or powder. The method is usually dictated by the fact that the drug is of a gaseous nature; however, it is also popular for its rapidity of effect, prolonged, easily controlled action, and direct effect on the lungs. Inhalation is divided into three major types:

Gas inhalation: almost entirely restricted to anesthesia.

Vaporization: where the drug is changed from a liquid or solid to a gas or vapor by the use of heat, such as steam inhalation.

Atomization or nebulization: the drug is atomized or nebulized into minute droplets by the use of compressed gas. With the advances in aerosols, this process is becoming more and more popular.

INUNCTION. Probably one of the oldest methods of medication, inunction implies "rubbing in", which is exactly what is done with ointments, creams, and liniments. Inunction comprises two distinct phases, local and systemic medication: local medication being when the drug is intended to relieve itching, burning, or any other undesirable skin condition, and systemic meaning that the drug is absorbed through the skin into the bloodstream. It is good to remember that the skin's absorptive power can cause undesirable side effects from drugs applied for local treatment.

RECTAL. Medication by rectum is often preferred to oral administration when there is danger of vomiting or when the patient is unconscious or mentally incapable. This method is also used in infants and those patients with gastrointestinal diseases which impair swallowing. The pharmaceutical types of medication by rectum include suppositories and retention enemas.

URETHRAL. Urethral suppositories are pencil shaped to ease insertion into the urethra, where the suppository will exert a local effect. Male urethral suppositories are 125 mm in length and weight approximately 4 grams. Female urethral suppositories are 50 mm in length and weigh approximately 2 grams. Both have a diameter of approximately 5 mm.

VAGINAL. Vaginal suppositories are generally oviform or globular in shape and are inserted into the vagina to produce a local effect. The suppositories weigh approximately 5 grams each and are used most commonly to treat trichomonal and candidal infestations of the vagina.

DRUG CLASSIFICATION

When dealing with drugs, it is absolutely vital to be familiar with them, their source, composition, action, dose, and use. It is not wise to administer a drug about which you know nothing, and a great many embarrassing errors have resulted from such neglect.

Drugs are classified by various methods, depending on their purpose.

GENERAL

By general classification, we group drugs according to their source, such as animal, vegetable, or mineral, usually specifying from what part of the animal they come, such as glands, etc., or whether from the root, bark, leaf, or fruit of the vegetable. Classification in the mineral kingdom includes crystals, earths, ores, etc.

CHEMICAL

Drugs are also grouped chemically, such as acids, alkalies, salts, alkaloids, etc.

Pharmaceutical

By this means we group them according to the pharmaceutical preparation in which they are available, such as syrups, elixirs, ointments, tablets, capsules, suppositories, and many more. You must keep in mind that a drug can have more than one of these classifications.

PHARMACOLOGICAL

The most important and useful classification of drugs is pharmacological—according to their action. Again, it must be kept in mind that a drug can have more than one action and consequently, more than one use, depending on the amount given or on the method of administration. The drugs, their actions, uses, doses, and other information about them which follow in this chapter will be grouped according to their pharmacology.

DRUG GROUPS

ACIDS

Acids may be classified as organic or inorganic. The aqueous acids may also be classified as strong or weak, according to their degree of ionization. Strong acids include hydrochloric, sulfuric, and nitric; weak acids include boric and the organic acids. The strong inorganic acids are known as mineral acids and are highly corrosive.

The official concentrated acids are not of uniform strength, but the official diluted acids have a uniform strength of 10%, with the exception of diluted acetic acid, which is 6%.

Hydrochloric Acid

ACTION AND USE—Official diluted hydrocholoric acid is employed in the treatment of achlorhydria and hypochlorhydria (a deficiency of hydrochloric acid in the gastric secretions). The acid should be diluted with water and sipped through a glass straw to prevent reaction upon the dental enamel.

USUAL DOSE: Diluted hydrochloric acid, 5 ml

NOTE: Technical hydrochloric acid is the muriatic acid of commerce. It contains impurities such as ferric chloride and organic matter, which gives it a yellow color. This form of hydrochloric acid must not be confused with the official acid as it is unfit for medicinal use.

Acetic Acid

ACTION AND USE—Acetic acid is used in a 1 to 2% solution in the treatment of superficial infections of the external auditory canal.

ANTACIDS

Antacids are drugs used to counteract too much acid in the stomach or to correct a low alkalinity in body fluids. Normally there is a certain degree of acidity in the stomach. The stomach contents may become too highly acid, irritate the mucous membrane, and cause symptoms commonly spoken of as indigestion or dyspepsia. Antacids such as magnesium hydroxide or milk of magnesia are indicated in this condition. As a result of disease, the intestinal tract may beome excessively acidic, which usually causes diarrhea. Antacids are commonly dispensed as prepared combinations such as Maalox®, Mylanta®, and Riopan®.

Aluminum Hydroxide Gel (Colloidal Aluminum Hydroxide)

ACTION AND USE—Aluminum Hydroxide gel is a white, viscous suspension used in treatment of gastric hyperacidity and peptic ulcer, and of intestinal toxemia as an absorbent for toxins, gases, or bacteria. It also acts as a protective and demulcent and is so employed in the treatment of inflamed areas of the gastrointestinal tract. Aluminum may cause constipation.

USUAL DOSE: 10 ml 4 to 6 times a day

RANGE: 5 to 30 ml up to 12 times daily

Magnesia Magna USP (Milk of Magnesia)

ACTION AND USE—Magnesia Magna is a suspension of magnesium hydroxide containing 7 to 8.5% of $Mg(OH)_2$. The USP permits use of suitable flavoring to make this preparation more palatable.

USUAL DOSE: Antacid, 5 to 10 ml 4 or more times a day (laxative, 15 to 30 ml)

RANGE: 5 to 60 ml daily

Sodium Bicarbonate

ACTION AND USE—Sodium bicarbonate is a white crystalline powder which is stable in dry air but slowly decomposes in moist air. It is used in the treatment of hyperacidity of the stomach and urine. Weak solutions are used frequently as irrigants and washes.

USUAL DOSE: 325 mg to 2 g 1 to 4 times a day

RANGE: 325 mg to 16 g daily

CAUTION: Heat should not be used to dissolve sodium bicarbonate because this will cause the bicarbonate to change to carbonate which will produce a local irritant similar to that of the caustic alkalies.

ASTRINGENTS

Astringents are drugs which produce shrinkage of the body membranes, especially mucous membranes. The principal use of astringents is to arrest seepage, weeping, or discharge from the membranes.

Alum

ACTION AND USE—Alum is used extensively as a local astringent in treatment of excessive sweating, especially of the feet. It is also used as a styptic, as an astringent in vaginal douches, and internally in the treatment of lead colic to precipitate the lead in the intestinal tract.

NOTE: Ammonium alum and potassium alum have a similar therapeutic action but differ as to chemical structure.

Zinc Oxide

ACTION AND USE—Zinc oxide is mildly astringent and possibly antiseptic. It is used in the treatment of various skin diseases, where it may also have a protective action in the form of ointments, lotions, and pastes.

Examples of zinc oxide preparation are zinc oxide paste (Lassar's Paste, plain) and zinc oxide ointment.

Calamine

ACTION AND USE—Calamine is used in the treatment of various skin afflictions in the same way as zinc oxide. Calamine consists essentially of zinc oxide with small amounts of ferric oxide, which gives it a pink color. It is astringent and protective and is generally used externally in the form of lotions and ointments, some examples of which are calamine lotion, phenolated calamine lotion, calamine ointment, and calamine liniment.

Aluminum Acetate Solution (Burow's Solution)

ACTION AND USE—Astringent, antipruritic, mildly antiseptic wet dressing used in the treatment of acute inflammatory conditions of the skin and mucosa. Use as hot or cold soaks, wet dressings, sitz-baths, gargles, douches, or wicks.

NOTE: Domeboro® tablets, packets, or powder are a combination of aluminum sulfate and calcium acetate which produces a modified Burow's Solution. pH 4.2.

ADSORBENTS

Adsorbents are drugs which "take up" other substances by adsorption. Adsorption means the attachment of one substance to the surface of another. Medically, these drugs are used to adsorb and eliminate undesirable secretions and exudates.

Kaolin NF (China Clay)

ACTION AND USE—Kaolin is a native hydrated aluminum silicate, powdered and freed from gritty particles by elutriation. It may be described as a soft, white or yellowish-white powder, with an earthy or claylike taste. When moistened with water, it assumes a darker color and claylike odor. It is used as an adsorbent in the treatment of certain skin afflictions, such as weeping eczema. It is also used as a pill excipient and diluent for oxidizing agents.

Kaolin Mixture with Pectin (Kaopectate®)

ACTION AND USE—This preparation contains kaolin and pectin in a flavored vehicle. It is an adsorbent and demulcent and is frequently used in the treatment of intestinal disorders such as diarrhea.

USUAL DOSE: 30 to 60 ml

Activated Charcoal USP

ACTION AND USE—Activated charcoal (carbo lingi) is a fine black powder, odorless, tasteless, and free from gritty matter. It is used largely in treating ailments of the gastrointestinal tract where it overcomes hyperacidity, adsorbs fermentative gases, and helps to remove irritating substances from the intestines. It is also effective as an antidote in the treatment of various poisonings. In pharmacy, it is used as a filtering medium and clarifying agent.

DOSE RANGE: 5 to 50 grams

DUSTING POWDERS

Dusting powders are finely ground powders of varying properties, used to protect and treat irritated skin surfaces.

Talc

ACTION AND USE—Talc is a very fine white or grayish white powder, slippery to the touch, adhering readily to the skin, and free of grittiness. It is used as a dusting powder, individually or in combination with other ingredients, in the treatment of irritated skin conditions. Talc is also used in the pharmacy as a filtering agent and as a dusting powder for pills and suppositories.

NOTE: Talc should never be applied to wounds or mucous membranes because of the resulting irritation.

Starch

ACTION AND USE—Starch (corn starch) is a fine white powder used as a dessicant dusting powder and is sometimes combined with talc or other ingredients. In the pharmacy it is used as a pill excipient.

NOTE: Moistened starch is subject to fermentation and souring. Starch can cause an overgrowth of *Candida albicans,* a yeast-like organism. A preservative must be added to solutions containing starch to prevent fermentation.

EMOLLIENTS

Emollients are drugs which soften, soothe, or smooth the skin or irritated surfaces. Most emollients are a combination of more than one ingredient, in the form of ointments, creams, or lotions.

Petrolatum, Liquid

ACTION AND USE—Liquid petrolatum (mineral oil) is a clear, viscid oil, derived from petroleum and is available as either light or heavy, depending on the viscosity. Heavy petrolatum is used as an emollient and lubricant. Since it is not decomposed or absorbed in the gastrointestinal tract, heavy petrolatum is used extensively as an emollient cathartic. Light petrolatum may be absorbed and should not be taken internally.

Petrolatum, White

White petrolatum is a white or faintly yellow semisolid mass, used extensively as an emollient, for external use. Pharmaceutically, it is a popular ointment base.

Theobroma Oil (Cocoa Butter)

ACTION AND USE—This is an excellent emollient with a pleasant odor, ideal for the treatment of chapped skin and lips, cracked nipples, or minor irritated or abraded skin areas. Since it melts at body temperature, cocoa butter is used as a suppository base.

Hydrous Wool Fat (Lanolin)

ACTION AND USE—This is a smooth, creamy ointment of wool fat containing approximately 25 percent water. Hydrous wool fat is an ideal emollient for the treatment of dry, scaly skin conditions.

Lubricating Jelly

ACTION AND USE—Jelly-like lubricant of vegetable origin, its primary uses are for lubricating instruments and gloves to facilitate insertion into body orifices during examinations. Lubricating jelly is preferred for gloves and other rubber goods since petroleum products deteriorate the rubber.

Zinc Oxide Ointment

ACTION AND USE—This is white petrolatum containing approximately 20 percent zinc oxide powder. It is used as an emollient with slightly astringent properties, and due to its opaqueness it is ideal for protecting sensitive skin areas from the sun.

EXPECTORANTS AND DEMULCENTS

Expectorants are drugs which aid in the expulsion of mucous exudated from the lungs, bronchi, and trachea. Commonly referred to as cough preparations, their action depends on liquifying the mucous exudates and stimulating the cilia of the bronchi for their expulsion. Demulcents are closely related and play an important role in cough preparations. Demulcents are thick, mucilaginous ingredients, usually flavored and sweetened, which soothe and protect inflamed mucous membranes.

Terpin Hydrate Elixer with Codeine

ACTION AND USE—This preparation is a hydro-alcoholic, sweetened preparation with terpin hydrate as the main active ingredient with 1 grain of codeine sulfate per fluid ounce added as a sedative to subdue the cough reflex.

USUAL DOSE: 5 ml

ANTISEPTICS, GERMICIDES, FUNGICIDES, PARASITICIDES, BACTERICIDES AND BACTERIOSTATICS

This is a group of drugs primarily intended for the prevention of infection by destroying bacteria, preventing their growth, or retarding their propagation. The field is highly specialized, both as to type of bacteria to be destroyed and also for what use the drug is intended

ANTISEPTICS:	Drugs which inhibit the growth of microorganisms, without necessarily destroying them
GERMICIDES:	Drugs which kill pathogenic microorganisms
FUNGICIDES:	Drugs which kill fungus
PARASITICIDES:	Drugs which kill parasites
BACTERICIDES:	Drugs which kill bacteria
BACTERIOSTATICS:	Drugs which inhibit the growth of bacteria

Coal Tar

ACTION AND USE—Coal tar contains the phenols, creosols, naphthalens, and like substances which give it disinfectant and local anesthetic properties. It is used in the treatment of various skin diseases to relieve itching and combat inflammation. It is usually prescribed in the form of ointment. If used for too long a period, it may cause severe dermatitis.

FOR EXTERNAL USE: Topical, in ointments and solutions in 1 to 20% concentrations. 1% ointment—Label for the skin: EXTERNAL USE ONLY; 20% solution—Use SHAKE WELL and EXTERNAL USE ONLY labels.

Phenol USP (Carbolic Acid, Phenolic Acid, Phenolic Alcohol)

ACTION AND USE—Locally, phenol is a general protoplasmic poison. In high concentrations, it precipitates protein. It is toxic to all types of cells and when applied to the skin causes blanching, followed by sloughing of the tissue. It also has a local anesthetic effect. In adequate concentrations it is fungicidal and bactericidal. The bactericidal efficiency is reduced by cold and alkaline media and is greater in aqueous solution than in glycerins or fats. (Liquefied phenol is phenol maintained in a liquid condition by the presence of about 10 percent water, and is a formulation which facilitates the dispensing of concentrated phenol.) Phenol has marked effect, first stimulating and then depressing, on the spinal cord. The blood pressure is lowered and circulation is greatly depressed.

Phenol is occasionally used to disinfect inanimate objects. Well diluted, it is employed as an antipruritic in lotions or ointments. Aqueous solutions stronger than 2% should not be used. Phenol is added as a preservative to preparations in ampuls. It is also used as a standard for comparison of disinfectant powder. The "phenol coefficient" of a substance is a number indicating the disinfectant value of the substance as compared with phenol.

TOXICOLOGY. The symptoms are local corrosion of the tissues (blanching), accompanied by severe pain; vomiting, the vomitus having the odor of phenol; general capillary damage resulting in low blood pressure; cold sweat; a marked fall in body temperature; scanty urine containing albumin, casts, and free hemoglobin, usually green to black in color; and shock, soon followed by death from respiratory failure.

TREATMENT. The only available treatment is symptomatic and supportive.

1. Gastric lavage, using olive oil, which dilutes the phenol and delays absorption. (Do not use mineral oil, alcohol, or glycerin.)
2. Allow some olive oil to remain in the stomach to act as a diluent and demulcent.
3. Administer saline injections to promote diuresis and protect the kidneys.
4. If phenol is spilled on the skin, it can be removed effectively with alcohol or castor oil.

FOR EXTERNAL USE (Liquefied Phenol): Apply locally, diluted to contain 0.5 to 2% of phenol, in preparations for use on skin.

Hexachlorophene (Gamophen)

ACTION AND USE—This is an antibacterial agent which is incorporated in soaps, detergents, creams, and so forth, in concentrations from 1 to 3%. These concentrations are effective in reducing the number of bacteria on the skin. Daily application in the form of a soap or other vehicle will cause a marked reduction of bacteria on the skin. Alcohol or other organic solvents are to be avoided since they wash residual hexachlorophene away. Soaps containing hexachlorophene, while once readily available, may now be obtained by prescription from a physician.

Cresol

ACTION AND USE—Cresol is a mixture of ortho-cresol, meta-cresol, and para-cresol. It is a much more powerful disinfectant than phenol. In the form most used, saponated cresol solution (Lysol, Compound Cresol Solution), it is used principally for disinfecting inanimate objects. It is about as poisonous as phenol, and the symptoms and treatment are the same.

Undecylenic Acid

ACTION AND USE—Undecylenic acid is a fatty component of sweat, used as a fungicide in ointments, dusting powders, and solutions. Zinc undecylenate is also used in this way.

FOR EXTERNAL USE: Topical, as ointment, 5% undecylenic Acid to 20% zinc undecylenate. Topical, as powder, 2% undecylenic Acid to 20% zinc undecylenate.

Nystatin (Mycostatin)

ACTION AND USE—Nystatin is an antifungal used to treat infections caused by *Candida albicans.* It is used in the treatment of fungus infections (moniliasis) of the mouth and throat and certain cutaneous fungus lesions. Nystatin has been employed orally for suppression of intestinal fungi and yeasts and locally for the treatment of vulvovaginal candidiasis.

USUAL DOSE: 500,000 units 3 times a day (Oral); Topical, as ointment containing 100,000 units in 1 g; Vaginal tablets, 1 to 2 tablets (100,000 to 200,000 U.) daily

RANGE: 1,000,000 to 3,000,000 units daily

Gamma Benzene Hexachloride (Kwell®, Gexane)

ACTION AND USE—Gamma benzene hexachloride is a very effective pediculicide and scabicide. It is used in 1% ointment, lotion, or shampoo forms or as a dusting powder. This drug may be toxic if applied too frequently since it can be absorbed through the skin. A single application is usually sufficient to eliminate the parasites. This drug may be irritating to the eyes. Discontinue immediately if local irritation develops.

FOR EXTERNAL USE: Topical, as 1% ointment, lotion, or shampoo.

Crotamiton (Eurax®)

ACTION AND USE—Crotamiton is an effective scabicide when employed topically in a

10% ointment or lotion. It is also used as an antipruritic. Side effects are rare.

FOR EXTERNAL USE: Topical, as 10% ointment

Benzalkonium Chloride (Zephiran Chloride)

ACTION AND USE—Benzalkonium chloride is one of the antiseptics of the cationic type, in which the action ion bears a positive charge. It is used in various concentrations as a disinfectant and fungicide. Solutions have a low surface tension and foam when shaken. The benzalkonium ion is incompatible with anionic wetting agents including soap (which should not be used with it or before it for disinfecting the skin). In addition, benzalkonium chloride is used for sterile storage or metal instruments and rubber articles. For this, a 1:1,000 to 1:750 solution should be used. When used for metal instruments, 2 grams of sodium nitrite and 5 grams of sodium bicarbonate should be added to each liter to prevent rust.

FOR EXTERNAL USE: Topically 1:750 to 1:10,000 solution as required.

Hydrogen Peroxide Solution

ACTION AND USE—Hydrogen peroxide solution is an active germicide only while it liberates oxygen. It deteriorates on standing or on contact with any oxidizing and reducing substances. It is decomposed by heat, light, and agitation. The solution is used most extensively in full or half strength in cleansing wounds. It is effective as a mouthwash in treatment of Vincent's angina and is a beneficial irrigation in the treatment of Trichomonas vaginalis vaginitis. It is employed to loosen impacted wax in ears.

FOR EXTERNAL USE: Topical, as wound prophylaxis, 1½ to 3% solution; as a mouthwash, 3% solution.

Sodium Hypochlorite Solution (Chlorox®)

ACTION AND USE—Sodium hypochlorite, diluted with about four to ten parts of water, is used as a footbath for prophylaxis against ringworm and other fungus infections. It is also used to disinfect inanimate objects. It is too strong to be applied to wounds. Labarraque's Solution, which is used as a cloth bleach, may be prepared by diluting sodium hypochlorite solution with equal parts of purified water.

CAUTION: This solution is not suitable for application to wounds.

FOR EXTERNAL USE: Topical, as solution (1 to 4 dilution).

Diluted Sodium Hypochlorite Solution

ACTION AND USE—This solution, also known as Modified Dakin's solution, is used as a surgical antiseptic, particularly for suppurating wounds, where it also dissolves necrotic tissue. As with all hypochlorite antiseptics, it has the disadvantage of dissolving blood clots, delaying clotting, and dissolving catgut and silk ligatures.

Silver Nitrate

ACTION AND USE—Silver nitrate is used in solutions varying from 0.1% to 10%. It is used as a mild antiseptic and astringent in irrigations of the bladder and urethra; as a germicide in treatment of infected ulcers of the mouth and throat; applied to the eyes of the newborn as a prophylaxis against gonorrheal conjunctivitis; in concentrated solution as a styptic.

FOR EXTERNAL USE: Topical as ophthalmic prophylaxis in newborn, 1% solution

Toughened Silver Nitrate (Silver Nitrate pencils, Fused Silver Nitrate, Lunar Caustic)

ACTION AND USE—Toughened silver nitrate, molded in pencil-shaped "stick" form is caustic and is used in removal of warts and corns, cauterization of wounds, and removal of granulation tissue. The stick is usually dipped into water and applied to the desired area for a period of time according to the degree of action required.

Tolnaftate (Tinactin)

Tolnaftate is a topical agent effective against certain species of fungus, notably epidermophyton, microsporum, and trichyphyton. It has no effect on candida or bacteria, so the infecting organism must be identified. Tolnaftate may be administered in conjunction with griseofulvin to obtain local relief. It is available as a powder, cream, or solution containing 1% tolnaftate.

USUAL DOSE: A small amount is applied twice daily to the infected area for 2 to 6 weeks.

Clotrimazole (Lotrimin)

Clotrimazole, a topical, wide spectrum antifungal, also effective against *Candida albicans* and *Tinea versicolor.*

Salicylic Acid

ACTION AND USE—A white crystalline powder, salicylic acid is too irritating to be taken internally. It is used locally as a keratolytic for the removal of corns and warts and in the treatment of fungus infections such as athlete's foot and ringworm. (A keratolytic removes horny layers of epidermis.) It is prescribed in the form of solution, lotion, collodion, ointment plaster, and dusting powder, in strengths ranging from 2 to 40%.

Benzoic acid

ACTION AND USE—Also a white crystalline powder, benzoic acid is an active bactericide and fungicide. Combined with salicylic acid (benzoic acid 65%, salicylic acid 3% - Whitfield's Ointment), it is widely used in the treatment of fungus infections of the feet.

In the form of sodium benzoate, it is a valuable food preservative, 0.1% strength being sufficient to prevent fermentation of canned goods, syrups, and similar preparations.

Formaldehyde USP (Formalin)

ACTION AND USE—Formaldehyde is an irritant and general protoplasmic poison. In high concentration it precipitates protein, and even in low concentrations, it is toxic to cells. In proper concentrations it is an effective germicide against all forms of organisms. It is used as a disinfectant for inanimate objects. Well diluted, it is employed as an irrigant in the the treatment of vaginal infections, fungus infections of the skin, and poison ivy. Because of its astringent actions, it is sometimes used in about 20% solution to check excessive sweating. It is primarily used as a tissue preservative.

USUAL STRENGTH: As stock solution, 37%

Methenamine Mandelate (Mandelamine®)

ACTION AND USE—Methenamine mandelate combines the therapeutic properties of methanimine and mandelic acid. This is a useful drug in the treatment of cystitis, pyelitis, and infections of the bladder. It is bactericidal and bacteriostatic in action and might be compared to sulfonamide drugs in this regard. This drug may be given over long periods of time. There are very few side effects.

USUAL DOSE: 1 gram up to 4 times a day

RANGE: 250 mg to 1 gram

Nitrofurantoin (Macrodantin®)

ACTION AND USE—Nitrofurantoin is administered orally for the treatment of bacterial infections of the urinary tract. It causes a few side effects such as nausea or vomiting. Taking it during the meal instead of before or after the meal can alleviate some of the side effects. This drug is not indicated if severe kidney damage is present. The urine may turn brown when it is administered.

USUAL DOSE: 50 to 100 mg 4 times a day. Oral dose should be continued for at least 3 days. After sterility of urine, a continued infection indicates need for reevaluation.

RANGE: 200 to 400 mg daily

CATHARTICS

Cathartics are drugs which promote evacuation of the bowels. They are used primarily to empty the colon, as in the treatment of simple constipation, and to rid the intestine of any irritant or toxic substances, as in enteritis.

Cathartics may be classified—

- according to their intensity of action or
- according to their mechanism of action.

However, emphasis is placed on the use of modern cathartics which modify the fecal mass, rather than by irritation of the gastrointestinal tract.

Cascara Segrada

ACTION AND USE—Cascara segrada is the dried bark of Rhamnus purshiana. Cascara segrada is the most popular of the emodin cathartics. Its action is mild and unaccompanied by discomfort. It may be prescribed as follows:

USUAL DOSE: As aromatic fluid extract, 5 ml; as tablets, 300 mg h.s.

Castor Oil

ACTION AND USE—Castor oil is a pale yellowish or almost colorless, viscid liquid with a faint, mild odor and a bland, usually nauseating taste. Its cathartic action is due to the presence of fatty acid, ricinoleic acid, which in the intestinal tract forms ricinoleates. The local irritant action of the ricinoleates is responsible for catharsis. It is a useful cathartic where evacuation of the small intestine is essential as in certain food poisonings. Castor Oil should not be taken during pregnancy or menstruation. DO NOT use when abdominal pain, nausea, or vomiting is present. Usually is effective in 2 hours. Preferable taken on an empty stomach.

USUAL DOSE: 15 ml

RANGE: 15 ml to 60 ml

Magnesium Sulfate (Epsom Salt)

ACTION AND USE—Magnesium sulfate occurs as small, colorless crystals, usually needle-like, and has a cooling, saline, and bitter taste. The action of all the saline cathartics is identical. They are absorbed slowly, and thus are retained in the intestinal tract for a comparatively long period. The intestinal wall acts as a semipermeable membrane between the intestinal contents and circulation, and fluid passes between the circulation and the intestinal tract until the solution of the saline cathartic is rendered isotonic with the body fluids. Therefore, if large amounts of the salt are taken, the volume of water retained in the intestinal tact is considerable and exerts a mechanical stimulus which increases peristalsis. The contents of the colon remain liquid and are rapidly expelled. Since the action of the salines removes a considerable amount of water from circulation, hypertonic solutions of certain cathartic salts may be given solely for their dehydrating effect. When salines are used for catharsis, sufficient water should be administered by mouth to avoid loss of body fluid. Do not use when abdominal pain, nausea, or vomiting are present. Most effective when taken on an empty stomach and usually effective in 3 to 6 hours.

USUAL DOSE: 15 g

RANGE: 10 to 30 g daily

Liquid Petrolatum (Mineral Oil)

ACTION AND USE—Mineral oil is an excellent lubricant as it is indigestible and unabsorbable. It also emulsifies with the feces, prevents loss of water from the intestines, and thus increases bulk of the fecal masses. If large doses are taken, the oil may escape through the anus. This may be prevented by decreasing the dose or by administering fractions of the dose at intervals during the day.

USUAL DOSE: 15 to 45 ml once a day

RANGE: 15 to 45 ml

Psyllium Hydrophilic Mucilloid (Metamucil®)

ACTION AND USE—This drug is used as an adjunct in the treatment of constipation. It forms a soft, gelatinous residue in the lower bowel.

USUAL DOSE: 1 rounded teaspoon, 1 to 3 times daily, thoroughly stirred in one glass of a suitable liquid.

Dioctyl Sodium Sulfosuccinate (Colace®)

ACTION AND USE—The original fecal-softening agent, this drug softens the fecal mass by lowering surface tension and permits normal movement of soft formed stools. Dioctyl sodium sulfosuccinate is used to restore normal bowel habits, particularly in constipation of geriatric, pediatric, obstetric, and surgical patients.

USUAL DOSE: 50 to 200 mg per day

RANGE: 50 to 200 mg daily

Bisacodyl (Dulcolax®)

ACTION AND USE—A contact laxative acting directly on the colonic mucosa to produce normal peristalsis throughout the large intestine. This mode of action permits either oral or rectal administration according to the needs of the patient. Used in the treatment of constipation and in preparation for surgery, proctoscopy, or radiological examination. Provides satisfactory cleansing of the bowel, obviating the need for an enema.

USUAL DOSE: 10 to 30 mg daily
Tablets available - 5 mg
Suppositories available-10 mg

Dioctyl Calcium Sulfosuccinate (Surfak®)

ACTION AND USE—Improved fecal softening agent, used in the treatment of constipation, particularly in obstetric, geriatric, surgical, and cardiac patients where avoidance of straining at stool is desirable.

USUAL DOSE: 1 capsule daily until bowel movements are normal

Standardized Senna Concentrate (Senokot®)

Senna extract is an irritant/stimulant type laxative derived from the senna plant. It acts only in the colon, 6 to 8 hours after administration, to stimulate peristalsis. Senokot® brand senna extract is available in tablets, granules, liquid, and suppositories. It is contraindicated in undiagnosed abdominal pain, intestinal obstruction, or fecal impaction. The patient should be advised that the drug may discolor urine.

USUAL DOSE: 2 to 4 tablets twice a day

AMEBACIDES

Amebiasis is a gastrointestinal disorder due to infestation by the pathogenic amoeba *Endamoeba histolytica.* It is a widely prevalent disorder particularly in tropical and semi-tropical climates. Drugs used to treat this disease by destroying the amoeba are called amebacides.

Metronidazole (Flagyl)

First introduced as a systemic trichomonacide, metronidazole is effective in the treatment of all forms of amebiasis. It is the drug of choice in amebic hepatic abscess and extraintestinal amebiasis and is employed in other amebic infections when the drug of choice is not effective.

USUAL DOSE: 500 to 750 mg three times a day for 10 days.

RANGE: 35 to 50 mg per kg of body weight per dose

ANTHELMINTICS

Anthelmintics are drugs which expel, paralyze, or kill intestinal worms. They are classed as vermicides, which kill or paralyze the worms, and vermifuges, which cause their expulsion without necessarily killing them. Taeniacides and taeniafuges are anthelmintics specifically intended to treat tapeworms.

Mebendazole (Vermox)

Mebendazole is effective in treating infestations of hookworm, roundworm, pinworm, and whipworm. Its action is by inhibition of glucose uptake by the worm. Side effects are rare though mild diarrhea and abdominal pain have been reported in heavy infestation. Mebendazole is contraindicated in pregnant women and children under two years of age.

USUAL DOSE: 100 mg twice a day for 3 days

Pyrantel Pamoate (Antiminth)

Pyrantel pamoate is effective in the treatment of pinworm and roundworm. Its action is exerted by the neuromuscular blockage properties causing paralysis in the worm and subsequent expulsion from the host. Side effects are rare but those that occur are usually manifested as gastrointestinal distress.

USUAL DOSE: One dose of 11 mg/kg body weight; maximum total dose is 1 g

How Supplied: Oral Suspension - 50 mg per ml

Pyrvinium Pamoate (Povan)

Pyrvinium pamoate is particularly effective in the treatment of pinworms and possibly effective in threadworm. Action is exerted by preventing the worm from absorbing nutrition, thus starving it. The drug is well tolerated; nausea, vomiting, and diarrhea being the most commonly observed side effects. The patient must be advised that pyrvinium pamoate will turn the stool bright red during and after treatment; the solution will stain clothes if spilled and the solution and tablets will stain the teeth. The solution should be taken through a straw and tablets swallowed and not chewed.

USUAL DOSE: Single dose of 5 mg/kg repeated once in 2 weeks if necessary

Thiabendazole (Mintezol®)

Thiabendazole is a broad spectrum anthelmintic and is the drug of choice in strongyloidiasis and cutaneous larva mitrans (creeping eruption). Due to potential toxicities other infestations are better treated using piperazine, pyrantel pamoate, or pyrvinium pamoate. Thiabendazole is also effective against trichinosis. Its action appears to be enzyme inhibition. Common side-effects are nausea, vomiting, and anorexia. Thiabendazole is not recommended in children weighing less than 15 kg or in patients with impaired hepatic or renal function.

USUAL DOSE: Adults under 68 kg, 25 mg/kg twice daily for 1 to 4 days
Adults 68 kg and over, 1.5 g twice daily for 1 to 4 days

How Supplied: Oral suspension, 500 mg per 5 ml

Piperazine Citrate (Antepar®)

ACTION AND USE—Piperazine citrate is useful as an anthelmintic for the treatment of infections caused by pinworms and roundworms. This drug is relatively non-toxic to humans and has few side effects if employed in the recommended dosage. The dosage is based on the body weight of the patient. For pinworms, the calculated dosage should be given in a single daily dose for seven days. For roundworms, a single daily dose for 2 consecutive days is usually adequate.

USUAL DOSE: Roundworms: A single daily dose of 3.5 g (Maximum daily dose); Pinworms: 65 mg/kg not to exceed 2.5 g per day

DIURETICS

Diuretics are drugs which increase the secretion of urine. They are used to remove body fluids, such as in edema, to dilute urine to make it less irritating to the bladder, and to aid in eliminating toxic waste products through the kidneys.

WATER

ACTION AND USE—Water is the true physiological diuretic; however, it is seldom spoken of as a drug, although forcing fluids has long been recognized as a therapeutic measure.

NOTE: Water should not be used as a diuretic in the treatment of edema, since it would only tend to increase the amount of body fluids.

Sodium Chloride

ACTION AND USE—Sodium chloride is a very effective saline diuretic. Saline diuretics may act by osmosis by means of hypertonic sodium chloride solutions. They are generally more potent diuretics than the isotonic sodium chloride. When a concentrated salt enters the blood vessels, fluid passes into the blood from the surrounding tissues until the blood stream again becomes isotonic, increasing the circulating blood volume and thus producing a diuretic effect.

Sodium chloride causes a copius flow of urine, thus promoting excretion of toxic matter. Isotonic sodium chloride solution increases blood volume and thus promotes the flow of large amounts of urine through the kidneys. It is also used to remedy conditions resulting from loss of sodium chloride such as heat stroke, or loss of blood by hemorrhage or surgery. It is administered to prevent dehydration in burns, sometimes in failure of gastric secretion, and occasionally to raise the blood pressure in hypotension.

In general the sodium chloride solutions are not employed in the treatment of edematous conditions. Sodium chloride is usually employed in therapeutics in the form of an intravenous isotonic sodium chloride (normal saline) solution of 0.9% sodium chloride, or as an electrolyte replenisher.

USUAL DOSE: Oral, 1 gram 3 times a day

RANGE: Oral, 3 to 6 grams daily;
Parenteral, as prescribed, based on the needs of the patient.

Chlorothiazide (Diuril)

ACTION AND USE—Chlorothiazide is a diuretic developed for use in control of edematous conditions. It is an exceptionally potent, orally effective, non-mercurial agent with diuretic activity equivalent to that of the parenteral mercurials. Its mechanism of action may be partially due to its effect as a carbonic anhydrase inhibitor and promotes the elimination of both sodium and chloride from the body via the tubules of the kidneys. Excretion of bicarbonate is minimal and excessive loss of potassium does not occur in appropriate therapeutic doses.

Chlorothiazide is well tolerated. Gastrointestinal symptoms such as nausea, vomiting, and diarrhea are relatively infrequent. The onset of action is rapid (within 2 hours) and its major effect is complete within 6 to 12 hours. The diuretic effectiveness does not decrease with repeated daily administration. It is used in all types of congestive heart failure in which diuretic therapy is required, in various forms of renal edema, and in toxemia of pregnancy. It is also useful in drug-induced edema due to certain drugs such as ACTH and cortisone and is of value in treating obesity in which fluid retention is a complicating factor.

Chlorothiazide is of value in the management of hypertension. One main effect appears to be potentiation of other anti-hypertensive agents such as reserpine, hydralazine, and ganglionic blocking agents.

CAUTION: As with other potent diuretics, patients must be carefully and regularly observed for early signs of fluid and electrolyte imbalance such as thirst, weakness, lethargy, muscle cramps, hypotension, gastrointestinal disturbances, and tachycardia.

USUAL DOSE: For Diuresis: 500 mg to 1 gram 1 or 2 times a day
For Hypertension: 500 mg to 1 gram a day

RANGE: 500 mg to 2 g per day

Hydrochlorothiazide
(Esidrix®, Oretic®, HydroDIURIL®)

ACTION AND USE—Hydrochlorothiazide is an improved analog of chlorothiazide and is approximately 10 times more active.

USUAL DOSE: 25 to 100 mg daily

DOSE RANGE: 25 to 200 mg per day

Chlorthalidone (Hygroton®)

ACTION AND USE—Chlorthalidone is of primary importance in the treatment of hypertension but is also effective in edematous states of any origin. It is particularly useful in treating ambulatory hypertensive/edematous patients. Those on prolonged therapy should be observed for electrolyte imbalance, particularly hypokalemia in those receiving digitalis.

USUAL DOSE: 50 to 100 mg initial daily dose, individually adjusted

RANGE: 50 to 200 mg daily

NOTE: Supplemental Potassium should be taken

Furosemide (Lasix®)

ACTION AND USE—Furosemide is a potent diuretic whose primary action is inhibition of electrolyte reabsorption in the renal tubules. Furosemide is used in the treatment of edema of cardiac, hepatic, and renal origin. It is also used in the emergency treatment of hypertension and pulmonary edema. Onset of action is rapid and of relatively short duration. The electrolyte and fluid balance of patients receiving furosemide should be closely monitored. Transient deafness, after large doses, has been noted, and other side effects include dermatitis and blood dyscrasias.

USUAL DOSE: Oral 40 to 80 mg initially, second dose 6 to 8 hours later, depending on response
I.V. 20 to 40 mg over 1 to 2 minutes

NOTE: Supplemental Potassium should be taken

ANALGESICS AND ANTIPYRETICS

Analgesics are drugs which are used to relieve pain without producing unconsciousness or impairing mental capacities. Many of these drugs also have an antipyretic effect. Antipyretics are drugs which lower increased body temperatures.

Sodium Salicylate

ACTION AND USE—The salicylates are antipyretics and analgesics. They lower the temperature rapidly in febrile patients but rarely affect normal body temperature. This is true of most antipyretics. As analgesics, the salicylates are less effective than morphine. Therapeutic doses have no important cardiovascular action. Toxic doses may depress circulation by vasomotor paralysis. The heart is not affected except in very large doses. Salicylates may irritate the gastrointestinal tract and cause epigastric distress, nausea and vomiting, and ulceration. Therapeutic doses increase the excretion of uric acid.

Salicylates relieve pain in headache, myalgia, arthralgia, and similar conditions. In acute rheumatic fever or gout, they reduce the pain, immobility, swelling, and inflammation of the joints.

USUAL DOSE: 650 mg every 2 to 4 hours

RANGE: 300 mg to 1 g

Aspirin

ACTION AND USE—This drug has the same uses as mentioned under sodium salicylate but is more effective. It is sometimes used as a gargle for sore throat. This is one of the safest and most useful analgesic, anti-inflammatory, and antipyretic drugs. Antacids help reduce gastrointestinal irritation.

USUAL DOSE: 650 mg (10 grains) every 4 hours as needed

RANGE: 325 mg to 2.6 g

NOTE: Use is contraindicated in peptic ulcer disease. Aspirin has an anticoagulant effect.

Acetaminophen (Tylenol)

ACTION AND USE—Similar to aspirin but without an anti-inflammatory action. It is available as tablets, elixer, or drops. Acetaminophen is an analgesic and antipyretic useful in aspirin sensitive patients.

USUAL DOSE: 325 to 650 mg 4 to 6 times a day

RANGE: 325 mg to 3.9 grams daily

Propoxyphene Hydrochloride (Darvon®)

ACTION AND USE—This drug is a mild analgesic. It is widely used in the treatment of muscular aches and pains, post-operative pain, and headaches, but it is no more effective than aspirin and not as safe.

USUAL DOSE: 65 mg 6 times a day as needed

RANGE: 32 mg to 520 mg daily

Propoxyphene Napsylate (Darvon-N®)

ACTION AND USE—Propoxyphene napsylate is a chemical salt of propoxyphene having the same analgesic properties as the parent compound. The difference in the hydrochloride and napsylate salts lies in their molecular weight and solubilities. One hundred milligrams of the napsylate salt are required to equal the effect of 65 mg of the hydrochloride salt.

USUAL DOSE: 100 mg 4 times a day as needed

RANGE: 300 to 400 mg daily

Propoxyphene Hydrochloride, Aspirin, Phenacetin, and Caffeine (Darvon Compound®)

ACTION AND USE—A sophisticated combination of several well known analgesics and antipyretics indicated for the reduction of pain, it is especially valuable for the relief of such conditions as headache, minor aches and pains, and post-operative pain of minor surgical procedures, including dental extraction.

USUAL DOSE: 2 capsules every 4 hours as needed

NOTE: Darvon and its compounds in combination with alcohol, tranquilizers, sedative-hypnotics, and other central-nervous-system depressants have added depressant effects. Toxic effects and fatalities have occured following overdoses of propoxyphene alone and in combination with other C.N.S. depressants. They can produce both psychological and physical drug dependence. They should be prescribed with the same degree of caution appropriate to the use of narcotics.

WARNING: Propoxyphene should NEVER be administered concurrently with Orphenadrine (a common ingredient of analgesic compounds, i.e. Norgesic)

CENTRAL NERVOUS SYSTEM STIMULANTS

Certain drugs stimulate the activity of various portions of the central nervous system. They are not exclusively used as central nervous system stimulants because they have many other actions. The central nervous system can be stimulated only for comparatively short periods of time since stimulation is soon followed by depression.

Caffeine and Sodium Benzoate®

ACTION AND USE—Caffeine combined with sodium benzoate has the same use as caffeine or citrated caffeine. It is a potent C.N.S. stimulant useful in the treatment of respiratory depression. It is available as a sterile solution in water for injection.

USUAL DOSE: 500 mg in 2 ml of solution IM

RANGE: 200 mg to 1 g, repeated as necessary

The Amphetamines (Amphetamine Sulfate, Dextroamphetamine Sulfate, etc.)

ACTION AND USE—The amphetamines comprise a group of drugs which are extremely powerful central nervous system stimulants used in the treatment of narcolepsy, mental depression, and alcoholism. Due to their stimulant effect, these drugs have been widely abused by the lay public with serious and tragic consequences. The Comprehensive Drug Abuse Prevention and Control Act of 1970 has been put into effect to control such drugs.

USUAL DOSE: Package insert should be consulted for dosage

Doxapram HC1 (Dopram®)

ACTION AND USE—Doxapram is a C.N.S. stimulant used for respiratory stimulation in chronic obstruction pulmonary disease. Its use postoperatively to stimulate respiratory recovery from anesthesia is questionable, and its use in other types of respiratory depression has been discontinued. It is contraindicated in patients with convulsive disorders, cerebral edema, and those taking monomine oxidase inhibitors and adrenergic agents.

USUAL DOSE: 0.5 to 1 mg/kg IV NOT to exceed the maximum dose per single injection of 1.5 mg/kg

Methylphenidate Hydrochloride (Ritalin®)

ACTION AND USE—A mild central nervous system stimulant and antidepressant used in the treatment of hyperkinesis, narcolepsy, and Minimal Brain Dysfunction in children.

USUAL DOSE: 20 to 30 mg daily in divided doses, preferable 30 to 45 minutes before meals

CENTRAL NERVOUS SYSTEM DEPRESSANTS

Central nervous system depressants comprise a large group of drugs, their degree of depression ranging from mild sedation to deep coma, differing primarily in rapidity, degree, and duration of action. The various groups of central nervous system depressants are of such importance that they will be dealt with at length under individual headings in this chapter.

Attention is invited to Chapter 21 of the *Manual of the Medical Department* which sets forth the requirements for proper control, custody, and accountability of controlled substances and drugs under the Comprehensive Drug Abuse Prevention and Control Act of 1970.

Barbiturates

The barbiturates are a widely used group of central nervous system depressants. They all have the same general action, differing in rapidity, degree, and duration. Their effects range from mild sedation to deep coma. They also produce respiratory depression. Large doses may cause vasodilation accompanied by a fall in blood pressure, injure the liver, and have an antidiuretic effect. With the exception of phenobarbital and barbital, barbiturates are detoxified by the liver and excreted by the kidney. They are habit-forming.

Barbiturates are used as hypnotics and sedatives, as anticonvulsants, as anesthetics for short or basal anesthesia, and in combination with analgesics to increase their analgesic effects. The increased effect is known as synergism. They are administered orally, rectally, subcutaneously, or intravenously.

TOXICOLOGY—Poisoning by barbiturates is a common occurrence both by accident and with suicidal intent. Poisoning is characterized by deep sleep or coma; slow respiration; weak, rapid pulse; a fall in body temperature; and moist, cold, cyanotic skin. The capillaries may dilate, and in the later stages shock may ensue. Death occurs from respiratory failure.

TREATMENT—If the barbiturate is taken orally:

1. Gastric lavage should be used or emetics employed if feasible, followed by magnesium sulfate to act as a cathartic.

2. Physiologic antidotes such as Metrazol® (brand of pentylenetetrazol), caffeine, or ephedrine, may be given to counteract the depressant.

Barbiturates, which also fall under the FDA drug abuse amendment, are cumulative poisons and are capable of causing chronic poisoning, with symptoms of drowsiness, failing memory, mental depression, incoherent speech, and disorientation. There may also be various nervous and gastrointestinal disorders, skin rashes, pruritus, loss of weight, and casts and albumin in the urine. The treatment consists of stopping the drug, hospitalization of the patient, and symptomatic treatment.

Amobarbital (Amytal®)

ACTION AND USE—Amobarbital is a moderately long-acting barbiturate.

USUAL DOSE: Dosage must be individualized for each patient.

RANGE: 15 to 200 mg

Amobarbital Sodium

ACTION AND USE—Same as amobarbital. Because of its solubility it may be administered intramuscularly or intravenously, as well as orally.

USUAL DOSE: 65 to 200 mg p.o. at bedtime for insomnia

RANGE: 65 to 500 mg

Phenobarbital (Luminal®)

ACTION AND USE—Phenobarbital is a long lasting barbiturate with onset of action in about one hour and a duration of action of 24 to 36 hours. It is more powerful than barbital, but its uses are similar. It is frequently used because of its anticonvulsant action in the treatment of epilepsy.

USUAL DOSE: Anticonvulsant 50 to 100 mg 2 or 3 times a day
Hypnotic 100 to 200 mg at bedtime
Sedative 15 to 30 mg 2 or 3 times a day

RANGE: 30 to 600 mg daily

Pentobarbital Sodium (Nembutal Sodium®)

ACTION AND USE—Pentobarbital sodium is short acting and has the same uses as the other barbiturates.

USUAL DOSE: Oral, 100 mg at bedtime
IV 100 mg.

RANGE: Oral, 50 to 200 mg daily
IV, 50 to 500 mg daily

Secobarbital Sodium (Seconal Sodium®)

ACTION AND USE—Secobarbital sodium is a barbiturate of short duration and has the same uses as the other barbiturates.

USUAL DOSE: Oral, 100 mg at bedtime

RANGE: 90 to 300 mg daily

MISCELLANEOUS DEPRESSANTS

Phenytoin Sodium (Dilantin®)

ACTION AND USE—Phenytoin sodium is used as an anticonvulsant in the treatment of epilepsy and is preferred to phenobarbital because it has no hypnotic properties. It is commonly used with phenobarbital to increase its action. It is more effective in the grand mal and psychomotor type seizures.

SIDE EFFECTS—Phenytoin sodium sometimes produces toxic symptoms such as giddiness, ataxia, nervousness, visual disturbances, slurring of speech, confusion, headache, dyspnea, difficulty in swallowing, acute gastric disturbance, and dermatitis. Hyperplasia of the gums occurs frequently and the patient should be advised to see a dentist regularly. Most symptoms are not serious and usually subside upon withdrawal of the drug.

USUAL DOSE: 100 mg up to 4 times a day

Paraldehyde

ACTION AND USE—Paraldehyde is a hypnotic and sedative and produces normal sleep, without after effects, in from 10 to 15 minutes. Its hypnotic effects are not as potent as those of chloral hydrate. Large doses depress respiration and cause hypotension. It is used in emergency treatment of tetanus, eclampsia, and status epilepticus.

Paraldehyde has a wide margin of safety, and although excessive doses may cause prolonged unconsciousness, fatalities are rare. The drug should be administered well diluted in a proper vehicle to avoid throat and gastric irritation.

CAUTION: Paraldehyde decomposes into acetic acid, which is dangerous. Every container should be carefully examined for evidence of decomposition and not dispensed if it has been opened for more than 24 hours.

USUAL DOSE: Oral 5-10 ml
Rectal 5-10 ml added to 2 volumes of olive oil. The parenteral route should be avoided if at all possible since IM administration tends to cause abscesses, but in the case of acute convulsive episodes, intravenous administration is acceptable although extremely hazardous.

RANGE: 3 to 30 ml

Alcohol (Ethyl Alcohol)

ACTION AND USE—Alcohol is a product of anerobic fermentation of sucrose by certain yeast enzymes. It may be prepared synthetically. Locally, alcohol injures the tissue cells by precipitating protein. It is irritating to open cuts and mucosa; applied to the skin it evaporates with a cooling effect; applied by rubbing, it produces mild redness and burning; injected hypodermically it causes local anesthesia. Systemically, alcohol is sedative in action. Although in small doses it stimulates the gastric mucosa, increasing the flow of juices, its effect on the central nervous system is progressively depressing. Respiration and heart action are slightly affected by a small dose, but continuous small doses produce hypnotic effects. Alcohol causes vasodilation resulting in a warm, flushed skin and a feeling of surface warmth, but it lowers the body temperature. When large amounts are ingested, the fall in temperature is very pronounced. High concentrations of alcohol injure the kidney epithelium.

Alcohol is a hydrocarbon and is oxidized in the body, yielding energy, so it may be considered a food. It cannot be stored or utilized to build tissue, but by yielding energy it lessens consumption of other foodstuffs; therefore, chronic alcoholics show signs of malnutrition.

Alcohol may be used locally—

- As a sponge bath in fevers.
- As a rubefacient and counterirritant.
- As a local anesthetic, injected in or near the nerves to allay pain, as in spasmodic facial neuralgia or sciatica.
- As an antiseptic, applied externally in 70% strength.

Systemically it may be used

- In treatment of insomnia in the form of whiskey, brandy, or wine.
- As a digestive stimulant.
- As a hypnotic.

OPIUM AND ITS ALKALOIDS

Morphine and codeine are the most important of the alkaloids of opium. Opium is a narcotic, depressing cerebral activity and producing analgesia and sleep. It is a respiratory depressant. Small doses dull the cough reflex and larger doses abolish it. This drug stimulates the spinal cord and the medullary vomiting center and is therefore never used as a sedative in strychnine poisoning or other convulsive states. It constricts the pupils. It causes constipation by diminishing the secretions of the gastrointestinal tract and increasing the tone of the intestinal musculature to the point of spasm. Morphine stimulates other smooth muscles to contraction. It has little effect on the cardiovascular system, but the therapeutic amounts of morphine relax the cutaneous blood vessels, causing flushing, itching, sweating, and sneezing. Opium is less depressant to respiration than morphine, probably because of the depressant effect of papaverine on the smooth muscles of the intestines. It is more likely to cause nausea because of its irritant action on the gastric mucosa.

Opiates are used—

- As analgesics. For this purpose morphine is preferred to the whole drug.
- As cough sedatives in bronchitis.
- As diaphoretics.
- As hypnotics.
- As treatment for certain types of diarrhea (preparations of the whole drug being preferred to morphine), and vomiting of reflex origin.

NOTE: All drugs listed in this section are regulated by the Comprehensive Drug Abuse Prevention and Control Act of 1970. Opium and morphine are drugs of addiction. This addition is extremely difficult to overcome and produces serious effects on the physical and oral condition of its victims. Their sale is strictly regulated in the United States and most other countries.

Paregoric (Camphorated Opium Tincture)

ACTION AND USE—This preparation must not be confused with opium tincture which is considerably stronger. It is employed mainly as an intestinal sedative to control diarrhea.

USUAL DOSE: 5 ml 1 to 4 times a day

RANGE: 5 to 10 ml

Morphine Sulfate

ACTIONS AND USE—Morphine Sulfate is more largely prescribed in the United States than any other salt of morphine. (See uses under opium above.)

USUAL DOSE: Oral or subcutaneous, 10 mg (1/6 grain) every 4 hours as needed

RANGE: 12 to 120 mg daily

Codeine Sulfate (Methylmorphine)

ACTION AND USE—Codeine resembles morphine in action but has about one-sixth of the analgesic power and about one-fourth of the respiratory despressant effect of morphine. It has the same therapeutic uses. It is habit forming and is less constipating. It is very useful in depressing the cough reflex.

USUAL DOSE: 30 to 60 mg

Meperidine Hydrochloride (Demerol Hydrochloride®)

ACTION AND USE—Meperidine hydrochloride is prepared synthetically. Chemically, it is not closely related to the opium alkaloids. It action is similar to a combination of morphine and atropine although milder than that of morphine.

USUAL DOSE: Oral and parenteral, 50 to 100 mg every 4 hours as needed

ANTI-PSYCHOTIC TRANQUILIZERS

These drugs, previously known as major tranquilizers, are used primarily in the treatment of psychiatric disorders, but also are useful for controlling nausea and vomiting.

Chlorpromazine Hydrochloride (Thorazine®)

ACTION AND USE—This drug is used in the treatment of mental and emotional disturbances. Its widest use is in alleviating manifestations of psychosis, tension, and agitation. It is also used in conjunction with surgical and obstetrical cases and in intractable pain. Dosage is highly individualized depending on severity of symptoms and degree of response.

SIDE EFFECTS. Chlorpromazine produces a number of side effects and toxic reactions, some of which may be serious. Cases of fatal blood dyscrasias have been reported.

CAUTION: This drug should not be used in comatose states in central nervous system depression due to barbiturates, opiates, alcohol, etc., and in patients intoxicated by large amounts of barbiturates or narcotics.

USUAL DOSE: 25 mg 4 times a day

RANGE: 10 mg to 2 grams daily

Promazine Hydrochloride
(Sparine®)

ACTION AND USE—Promazine is used for management of the acutely disturbed patient and has a similar action to chlorpromazine. It allays symptoms of acute hyperactivity and inhibits maniacal impulse through a tranquilizing and calming action. Promazine causes little or no fall in blood pressure or undue mental depression.

CAUTION: Use with caution in comatose states due to central nervous system depressants. There is also danger of blood dyscrasia with prolonged use.

USUAL DOSE: 25 to 200 mg as directed by physician

Prochlorperazine (Compazine®)

ACTION AND USE—Prochlorperazine is a compound similar in action and use to chlorpromazine, to which it is related chemically, but it is more potent. It is mildly antihistaminic and antispasmodic. It is employed as an antiemetic and is five times more potent than chlorpromazine. Prochlorperazine is less toxic than chlorpromazine.

SIDE EFFECTS—Side effects are generally mild and include dizziness, hypotension, tinnitis, and vertigo. No jaundice or blood dyscrasias have been reported. When high doses are used, spasticity and constriction of skeletal muscles may result.

USUAL DOSE: 8 mg (equivalent of 5 mg of base) every 3 or 4 hours

RANGE: 8 to 16 mg

Trifluoperazine Hydrochloride
(Stelazine®)

ACTION AND USE—Tranquilizing drug used in the treatment of anxieties, neuroses, and psychotic states.

USUAL DOSE: 1 to 2 mg twice daily, as directed

SKELETAL MUSCLE RELAXANTS

These skeletal muscle relaxants are used to produce muscular relaxation during surgical anesthesia and are used in connection with the treatment of muscle spasms due to various conditions.

Chlorzoxazone Tablets
(Paraflex®)

ACTION AND USE—An oral skeletal muscle relaxant particularly effective in the treatment of painful skeletal muscle spasm associated with such conditions as acute and chronic backpain, bursitis, contusions, strains and sprains, tension headaches, and tenosynovitis.

USUAL DOSE: One tablet 3 to 4 times a day. The initial dose in severe cases should be two tablets.

Orphenadrine Citrate
(Norflex®)

ACTION AND USE—Long-lasting muscle relaxant used in the treatment of acute spasm of voluntary muscles especially post-traumatic, discogenic, and tension spasms.

NOTE: Do not give in combination with propoxyphene (Darvon®)

Methocarbamol (Robaxin®)

ACTION AND USE—Skeletal muscle relaxant used in the treatment of acute muscle spasm, such as that peculiar to sprains, strains, dislocations, and conditions due to arthritis, bursitis, low back disorders, and nocturnal leg cramps.

USUAL DOSE: 2 to 6 grams per day in divided doses, or as directed by the physician.

NEUROMUSCULAR BLOCKING AGENTS

Tubocurarine Chloride (d-Tubocurarine Chloride)

ACTION AND USE—Tubocurarine chloride in small doses blocks the transmission of nerve impulses to skeletal muscle. Larger doses depress ganglionic transmissions in the autonomic nervous system. It is used in a number of conditions to reduce the tone of contractile skeletal muscle. It is used as an adjunct to anesthetic agents which do not bring about adequate muscular relaxation, in spastic conditions, in conjunction with shock therapy to reduce convulsions, and as a diagnostic aid in myasthenia gravis.

NOTE: This is a very potent drug and may cause respiratory failure. It must be administered by highly trained individuals.

USUAL DOSE: IV, 6 to 9 mg. in 30 to 90 seconds, followed in 5 minutes by 3 to 5 mg. as needed

Succinylcholine Chloride (Anectine®)

ACTION AND USE—Potent and short-acting, this drug is used in surgical procedures and orthopedic manipulations (setting fractures and dislocations.)

USUAL DOSE: Individualized but usually 40 mg (2cc)
IV initially, but the dosage will vary from 20 to 80 mg

SEDATIVES/HYPNOTICS

Diazepam (Valium®)

ACTION AND USE—Diazepam is principally an antianxiety agent but has other applications as an anticonvulsant, musculoskeletal relaxant, and reanesthetic sedative. It is effective in relieving anxiety and tension and in moderating the effects of alcohol withdrawal. It provides some degree of amnesia prior to anesthetic induction. Diazepam is the drug of choice in status epilepticus and has some effect in petit mal epilepsy. It is used with other skeletal muscle relaxants, though, by itself, its relaxant properties are due to its sedative effect.

Untoward effects are rare but include drowsiness, fatigue, and ataxia. Adverse effects of IV administration include hypotension, tachycardia, and respiratory depression. Rapid injection of diazepam can cause respiratory arrest. Diazepam should not be mixed with other fluids for parenteral administration.

USUAL DOSE: Oral 5 to 40 mg 2 to 4 times daily in divided doses; IV 5 to 10 mg injected slowly

RANGE: 10 to 160 mg daily

TRANQUILIZING DRUGS

Meprobomate (Equanil®, Miltown®)

ACTION AND USE—Meprobamate is an antianxiety drug with muscle relaxant properties. It acts on the central nervous system but has no effect on respiration, heart action, or other autonomic functions.

DOSE RECOMMENDED: Oral, 400 mg. 3 times daily and at bedtime, if desired.

Chlordiazepoxide Hydrochloride (Librium®)

ACTION AND USE—A unique and versatile therapeutic agent, it is virtually a specific for the relief of anxiety and tension.

USUAL DOSE: Oral 10 to 100 mg daily; IM 50 to 100 mg

RANGE: 10 to 100 mg daily

CARDIOVASCULAR DRUGS

Cardiovascular drugs comprise a large group which affect the action of the circulatory system. Most of these drugs are highly specialized and will be listed here according to their principal action.

MYOCARDIAL DRUGS (Drugs which affect the heart muscle)

Digitoxin (Digitaline Nativelle®, Crystodigin®)

ACTION AND USE—Digitoxin has an advantage over digitalis in that the dose is smaller and very little nausea and vomiting are produced. It is gradually replacing digitalis powder because the dosage can be determined more accurately and because of its chemical purity. It makes rapid digitalization possible with little gastrointestinal irritation.

CAUTION: Digitoxin is extremely poisonous.

USUAL DOSE: Initial dose, 1-5 mg over 24 to 48 hours in divided doses; maintenance, 0.1 mg daily

Digoxin (Lanoxin®)

ACTION AND USE—Digoxin, like digitoxin, produces the characteristic digitalis effects rapidly. It is given in small dosages. Overdosage may produce toxic symptoms similar to those of digitalis. It is administered orally.

CAUTION: Digoxin is extremely poisonous.

USUAL DOSE: Initial, 1.5 mg or 3 mg over 24 hours; maintenance, 0.25 mg daily

RANGE: Initial, 0.5 to 2 mg; maintenance, 0.25 to 0.75 mg per day

Quinidine Sulfate

ACTION AND USE—Quinidine sulfate is a cardiac drug, but its actions differ somewhat from those of the digitalis group. It is a depressant to the cardiac muscle and is used extensively in the treatment of atrial fibrillation and paroxysmal atrial tachycardia. It resembles quinine in being a general protoplasmic poison, in its antipyretic and oxytocic action, and in its antimalarial properties.

USUAL DOSE: 0.2 gram up to 6 times a day

RANGE: 0.2 to 0.6 gram

WARNING: Do not confuse with Quinine Sulfate.

VASODILATORS

These drugs produce vasodilation by relaxing the smooth muscle of the arteries and thereby lowering the blood pressure. This fall in blood pressure is the most important pharmacological action desired.

Amyl Nitrite

ACTION AND USE—Amyl nitrite is used when immediate vasodilation is desired, especially in angina pectoris. It increases the circulation in the coronary arteries while lowering the blood pressure. Containers for amyl nitrite are wrapped loosely in gauze and cotton and can readily be crushed with the fingers and the contents then inhaled. It is sometimes used for pain associated with circumcision.

CAUTION: Amyl nitrite is very flammable.

USUAL DOSE: 0.3 ml by inhalation

Glyceryl Trinitrate Tablets (Nitroglycerin Tablets)

ACTION AND USE—Glyceryl trinitrate acts very quickly. Its action is to dilate the coronary arteries. The blood pressure drops rapidly after sublingual administration, and the action is completed within about one-half hour. It is used where rapidity of action is desired as in angina pectoris. It should be administered with caution, as it may produce severe headache.

USUAL DOSE: Sublingual, 0.4 mg prn

RANGE: 0.2 to 0.6 mg

Pentaerythritol Tetranitrate Tablets (Peritrate®)

ACTION AND USE—The vasodilating effects of pentaerythritol tetranitrate are of slower onset but more prolonged action than those of the nitrates. It is used to lower the blood pressure in various circulatory disturbances where constant effect is desired.

USUAL DOSE: 10 mg orally 3 to 4 times daily

RANGE: 30 to 40 mg daily

Dipyridamole (Persantin®)

ACTION AND USE—Increases coronary blood flow by selective dilating of the coronary arteries, thereby increasing coronary sinus oxygen saturation without altering myocardial oxygen consumption. Used in the treatment of arteriosclerotic heart disease, post-myocardial infarction, and angina pectoris.

USUAL DOSE: 25 to 50 mg two or three times daily BEFORE MEALS

RANGE: 50 to 150 mg daily

Procainamide HCl (Pronestyl®)

ACTION AND USE—Procainamide is used in the treatment of cardiac arrythmias with an action similar to that of quinidine. It is most useful in correcting ventricular arrythmias. Large doses can cause cardiac irregularities, and IV administration may cause hypotension. It is contraindicated in complete heart block.

USUAL DOSE: Orally an intial 1 gram dose followed by a total daily dose of 50 mg/kg given at 3 hour intervals.
IM 0.5 to 1 g q 6 h until oral therapy is possible.

CAUTION: Intramuscular administration is the parenteral method of choice and IV administration should be reserved for extreme emergencies.

Isosorbide Dinitrate (Isordil®)

ACTION AND USE—Isosorbide is similar to nitrogylcerin in its anti-anginal action. It provides relief from attack in 2 to 5 minutes and has a duration of action of 1 to 2 hours. Isosorbide can be used prophylactically in situations known to precipatate an anginal attack. It is also used as a vasodilator in congestive heart failure and hypertension. Adverse reactions include dizziness, throbbing headaches, and flushing of the face. Hypotension and tachycardia are occasionally noted.

USUAL DOSE—Angina: Sublingual 5 mg at time of attack
Congestive heart failure and hypertension: 1 or 2 5 mg tablets sublingually every 2 to 3 hours or one 40 mg capsule by mouth every 6 to 12 hours as needed.

VASOCONSTRICTORS

The opposite of vasodilators, these drugs produce constriction of the blood vessels with consequent rise in blood pressure. Some other uses will be discussed under the individual drugs.

Epinephrine (Adrenalin)

ACTION AND USE—Epinephrine occurs naturally in the medulla of the adrenal glands. One of the main therapeutic actions is to constrict the peripheral blood vessels. It controls capillary hemorrhage and shrinks mucous membranes of the nose. It is used to localize the effects of anesthetic agents such as procain hydrochloride. It is used to treat urticaria and anaphylactic shock, for which it is the drug of choice. Epinephrine raises the blood sugar and should be used with caution when treating diabetics. It is generally used in the form of epinephrine hydrochloride in solutions as follows: 1:100 for asthma by means of nebulizer, 1:1000 for subcutaneous injection. It is the drug of choice for acute asthma attacks.

CAUTION: Do not use epinephrine solution if it is brown in color or contains a precipitate.

USUAL DOSE: Topical as a 1:1000 solution
Oil Suspension: Subcutaneous 0.4 to 2.0 mg of 1:1000 q 8 to 16 hours prn
Aqueous solution: Subcutaneous 0.1 to 0.5 mg of 1:1000

CAUTION: Epinepherine suspensions must not be given IV.

Ephedrine

ACTION AND USE—Ephedrine is an alkaloid used to shrink the nasal mucosa when applied locally in a saline solution. It raises blood pressure in patients undergoing spinal anesthesia. It is also employed in certain types of hypotension. The action of ephedrine is more sustained than epinephrine, and it is used to treat patients with urticaria and hay fever. It relaxes smooth muscle and relieves bronchial constriction, hence its value in asthmatic conditions. The salts of ephedrine, particularly the sulfate or hydrochloride, are, as a rule, employed for the systemic effect of the alkaloid. Unlike epinephrine, it is effective orally and is used for nocturnal wheezing.

USUAL DOSE: As a sulfate, oral or subcutaneous, 25 mg every 4 hours
TOPICAL, 3 to 5% ophthalmic solution and 1 to 3% aqueous solution for nasal decongestion.

RANGE: 15 to 50 mg

Tetrahydrozoline Hydrochloride
(Tyzine®, Visine®)

ACTION AND USE—This is a sympathomimetic agent, and when applied topically to the nasal mucosa, the drug causes vasoconstriction. It is useful in rhinitis, sinusitis, and hay fever. Occasionally, rebound vasodilation may result. It must be administered with caution to hypertensive and hyperthyroid patients. Visine is used as an ophthalmic preparation for vasoconstriction.

SIDE EFFECTS—Side effects such as coma and shock have been caused by overdosage in young children.

CAUTION:The 0.1% solution should never be administered to children under six years of age.

DOSE RECOMMENDED: Adult, 2 to 3 drops of 0.1% solution every 3 hours
Children, 2 drops of 0.05% solution every 6 hours

Levarterenol Bitartrate
(Norepinephrine Bitartrate, Levophed®)

ACTION AND USE—Levarterenol bitartrate is a powerful vasoconstrictor. It is used to raise the blood pressure in severe hypotension during and after surgical operations and in hemorrhage. It does not replace intravenous administration of fluids or blood volume expanders in treating hemorrhage but is generally added to an intravenous fluid such as isotonic saline or five percent dextrose in saline. Patients receiving this drug should have their blood pressure taken every few minutes to avoid overdosage.

CAUTION: Do not use solutions of levarterenol bitartrate if brown in color or containing a precipitate.

USUAL DOSE: IV infusion, 2 to 4 mcg per minute

RANGE: 1 to 10 mcg

CAUTION: The infusion site must be checked frequently for free flow. If infiltration should occur, 5 to 10 mg of Regetine in saline solution should be injected immediately to avoid tissue necrosis.

Phenylephrine Hydrochloride
(Neo-Synephrine Hydrochloride®)

ACTION AND USE—Phenylephrine hydrochloride is a synthetic drug which raises blood pressure and is relatively nontoxic. It shrinks mucous membranes of the nose and relieves local congestion. It slows absorption of local anesthetics and is used in the management of hypotension caused by the failure of blood vessels to contract but not for hypotension following loss of blood volume. In ophthalmology it is used as a mydriatic.

USUAL DOSE: Subcutaneous or IM, 5 mg 3 times a day

RANGE: 1 to 20 mg

FOR EXTERNAL USE: Topical, 0.1 ml of ¼ to 10% solution to mucous membranes

COAGULANTS

Coagulants are drugs which enhance or hasten the coagulation process of the blood. Administering coagulants before surgery has become almost routine as an aid in controlling bleeding.

Menadione (Vitamin K_3)

ACTION AND USE—Coagulant given preoperatively to aid in the control of bleeding. Also given during and after surgery, and as routine prophylaxis for the newborn.

USUAL DOSE: 10 mg daily

RANGE: 2 to 25 mg

HEMOSTATICS

Drugs which control external bleeding by forming an artificial clot.

Oxidized Cellulose

ACTION AND USE—Oxidized cellulose is a form of cotton or gauze, slightly acid to taste, soluble in dilute alkalies but insoluble in acids or water. It is used as a surgical hemostatic agent, acting as an artificial clot.

Absorbable Gelatin Sponge

ACTION AND USE—This is a sterile, water-insoluble, gelatin-base sponge. It is used as a hemostatic agent when saturated with sterile normal saline solution or a thrombin solution. It may be left in the body since it is slowly absorbed.

ANTICOAGULANTS

Drugs which delay or prevent blood coagulation.

Bishdroxycoumarin (Dicumarol®)

ACTION AND USE—This drug is used as an anticoagulant, acting by interfering with prothrombin formation in the liver. It prolongs the clotting time by exhibiting antiprothrombin and antithrombin effects in the blood stream; it does not produce an immediate effect. During bishydroxycoumarin therapy, if the prothrombin time drops below 15% of normal, its action should be neutralized by injections of vitamin K. Whole blood transfusions should also be given. This drug should be employed only if laboratory facilities are available to test the level of blood prothrombin.

USUAL DOSE: Initial, 200 mg; then up to 300 mg thereafter, according to prothrombin determination

Wafarin Sodium (Panwarfin®, Coumadin)

ACTION AND USE—This drug is a powerful anticoagulant similar in action to Dicumarol. It is used extensively for the treatment of embolisms, aneurisms, and the prevention of infarctions and occlusions.

USUAL DOSE: As directed by the physician; all dosage factors predicted on a wide variety of clinical findings.

Oral or IV: Initial 15 mg, then 5 to 10 mg daily, in accordance with Prothrombin Time determinations.

RANGE: Initial 25 to 75 mg

Heparin Sodium

ACTION AND USE—This drug inhibits the clotting of blood and formation of fibrin clots. It is used in anticoagulant therapy in prophylaxis of venous thrombosis and as treatment to prevent its extension, as well as in prophylaxis and treatment of pulmonary embolism.

USUAL DOSE: See package insert or P.D.R.

WARNING: When heparin sodium is administered in therapeutic amounts, its dosage should be regulated by frequent blood coagulation tests. If the coagulation time is unduly prolonged or if hemorrhage occurs, heparin sodium should be discontinued promptly.

Vitamins

Vitamins are essential substances for maintenance of normal metabolic functions. They are not synthesized in the human body in normally adequate quantities, therefore, they must be provided from outside sources.

Vitamin A

Viatmin A is present in fish liver oils, liver, butter, eggs, cream, yellow vegetables, and fruits. In butter, cream, eggs, and carrots, both vitamin A and provitamin A (Carotene) may be present. Provitamin A is capable of being changed into A by body mechanisms.

Vitamin A is used to remedy such deficiency conditions as night blindness, xerophthalmia, and keratosis of the skin. The daily requirement for a healthy adult is about 5,000 U.S.P. units and for growing children about 1,500 to 5,000 units.

USUAL DOSE: Daily, prophylactic: 5,000 U.S.P. units
Therapeutic: 25,000 U.S.P. units

B Vitamins

Vitamin B Complex consists of a number of factors, some of which have been identified and synthesized. It is less stable than vitamin A, although some of its constituents can withstand heat for a short time. The best natural sources are rice polishings, yeast, and liver. Other good sources include fruits, meat, milk, and eggs.

Thiamine (Vitamin B_1)

ACTION AND USE—Thiamine was the first recognized constituent of vitamin B complex to be isolated in crystalline form. It is the first antineuritic vitamin which prevents beriberi and polyneuritis. It is used as a specific for the prevention and treatment of beriberi. It may also be used in the treatment of patients with appetite loss resulting from dietary disturbance. An increase in thiamine may be necessary if metabolism is increased as occurs in patients with hyperthyroidism or fevers.

USUAL DOSE: Prophylactic, 1 to 2 mg;
therapeutic 10 to 15 mg

RANGE: 1 to 50 mg

Riboflavin (Vitamin B_2, Vitamin G, Lactoflavin)

ACTION AND USE—Deficiency of this vitamin causes pellagra, and its principal use is in the treatment of this disease. Improvement occurs within 24 hours.

USUAL DOSE: Prophylactic, 2 mg;
therapeutic 5 - 10 mg

RANGE: 2 - 15 mg

Pyridoxine (Vitamin B_6)

ACTION AND USE—Pyridoxine appears to be associated with certain neuromuscular conditions and with the utilization of fatty acids, but its value in the treatment of human disease is not yet clearly established. It has been used in the treatment of palsy, muscular atrophy and weakness, agranulocytic angina, and in combination with some of the antihistamines such as meclizine hydrochloride and cyclizine to overcome nausea and vomiting. It is used in combination with Isoniazid to prevent the development of peripheral neuritis during Isoniazid therapy.

USUAL DOSE: Prophylactic, 1 or 2 mg;
therapeutic, 5 mg to 150 mg

Cyanocobalamin (Vitamin B_{12}, Rubramin PC®)

ACTION AND USE—Cyanocobalamin is essential to growth, cell reproduction, and hematopoiesis. It is used in the Schilling Test for pernicious anemia.

USUAL DOSE: IM, 10 to 100 mcg once a
month or every other month

RANGE: 1 to 200 mcg

Ascorbic Acid (Vitamin C)

Ascorbic acid is necessary for the prevention and cure of scurvy. It is also believed that a deficiency delays wound healing.

ACTION AND USE—Ascorbic acid is present in potatoes, citrus fruits, green vegetables, tomatoes, and strawberries. It is relatively unstable in solution and is readily lost during cooking if simple precautions to avoid aeration are not taken. Loss of vitamin C may occur in fresh fruits and vegetables that are stored for any length of time.

USUAL DOSE: Requirement, 75 mg;
therapeutic, 500 mg

RANGE: 75 mg to 1 gram

Vitamin D

Vitamin D is often called the antirachitic vitamin. It is fat soluble and is present in fish liver oils, egg yolks, milk, and butter. It affects the absorption and utilization of calcium and phosphorus in the body and is used in the prophylaxis and treatment of rickets in children and softening of the bone in adults. It has some relationship with functions of the thyroid and parathyroid glands. An excessive intake of vitamin D causes a decrease in the amount of calcium and phosphate in the intestinal contents and overcalcification at the growing end of the bones.

USUAL DOSE: Average requirement, 400
units (10 mcg) daily

Polyvitamin Preparations

Widespread use of vitamins has served to control and even eradicate, to a large extent, the important deficiency diseases in this country. Rickets, for example, has become exceedingly rare. Pellagra, until recently prevalent in the southern United States, is now controlled.

Vitamin deficiencies are primarily due to defective diets and consequently the deficiency is rarely due to the lack of only one vitamin, but several. In addition, several vitamins are usually metabolically related, thus they are dispensed in balanced proportions in the form of polyvitamin preparations.

To list all polyvitamin preparations available would require more space than can be devoted. Following are some of the more representative ones:

Poly-Vi-Sol (tablets, drops)

ACTION AND USE—a dietary supplement

Vitamin A - 2,500 units
Vitamin D - 400 units
Ascorbic acid - 60 mg
Thiamine - 1.05 mg
Riboflavin - 1.2 mg
Niacinamide - 13.5 mg
Vitamin E - 15 IU
Pyridoxine - 1.05 mg
Cyanocobalamin - 4.5 mcg
Pantothenic acid - 7 mg
Folic acid - 0.3 mg

USUAL DOSE: 1 tablet daily

Tri-Vi-Sol (tablets, tablets with iron, drops)

ACTION AND USE—A dietary supplement

Vitamin A - 2,500 units
Vitamin D - 400 units
Ascorbic acid - 60 mg

USUAL DOSE: 1 tablet daily

SULFONAMIDES

The pharmacological action of sulfonamides is bacteriostatic. Basically, this means that the drug interferes with the chemistry of bacterial reproduction with resultant extinction. Although discovered early in the twentieth century, sulfonamides didn't become popular until World War II, and since then, many have become obsolete as new ones have become available. To list them all would take more space than alloted, consequently, only the more common ones will be listed here.

Sulfadiazine

ACTION AND USE—Sulfadiazine is well tolerated in the body and reports of toxicity are infrequent. Effective blood levels with this drug are rapidly reached and sustained on therapeutic oral doses. A daily urine output above 1,000 ml should be maintained to avoid urinary obstruction. Forced fluids and sodium bicarbonate are recommended with administration.

Sulfadiazine is effective in the treatment of pneumococcic pneumonia and meningoccocic meningitis, genitourinary tract infections, in severe hemolytic streptococcic and micrococcic (staphylococcic) infections, and in other sulfonamide susceptible infections.

USUAL DOSE: Initially, 2 to 4 grams, then 500 mg to 1 gram 4 times a day

RANGE: 2 to 8 grams daily

Sulfisoxazole (Gantrisin®)

ACTION AND USE—Sulfisoxazole is similar in action and uses to other sulfonamides. This drug is less likely to cause crystalluria due to its high solubility in body fluids contrasted to the less soluble sulfonamide derivatives. This drug is particularly effective in urinary tract infections due to organisms of the Proteus group.

USUAL DOSE: Initially, 2 to 4 grams then 1 to 2 grams 4 times a day

RANGE: 2 to 12 grams daily

Succinylsulfathiazole (Sulfasuxidine®)

ACTION AND USE—Succinylsulfathiazole is poorly absorbed from the intestinal tract where it exerts a bacteriostatic effect against certain bacteria, particularly the gram-negative organisms such as *Escherichia coli* and dysentery bacilli, *Shigella shigae, Shigella flexneri,* and *Shigella sonne.* Toxicity occurs infrequently. When administered in therapeutic doses, it has an inhibiting effect on intestinal flora resulting in semifluid, practically odorless stools of low bacterial count. It is recommended for preoperative preparation and postoperative treatment of patients requiring surgical operations of the rectum and for carcinoma of the colon, fecal fistula, and other operations of the intestinal tract. It may be used in the treatment of acute bacillary dysentery. It can be administered for as long a period of time as necessary.

USUAL DOSE: See package insert.

Phthalysulfathiazole (Sulfathalidine®)

ACTION AND USE—This drug is used in the treatment of intestinal infections caused by sulfonamide-susceptible organisms. It is useful in the treatment of inflammation of the intestinal tract and for the pre-surgical treatment of patients who are to be subjected to surgery of the intestine or colon.

USUAL DOSE: Initial 125 mg/kg divided equally and administered at intervals of 6 or 8 hours.

RANGE: 4 to 8 grams daily

Sulfacetamide (Sodium Sulamyd®)

ACTION AND USE—The sodium salt is used for topical treatment of the eye and it is reputed to be free of sensitization reactions.

USUAL DOSE: Topically, solution, 1 or 2 drops every 2 to 3 hours. Ointment, apply a small amount 4 times daily.

Trimethoprim and sulfamethoxazole (Bactrim, Septra)

ACTION AND USE—Trimethoprim's action is inhibition of the enzyme pathway of certain organisms, and in combination with sulfamethoxazole, it is used in chronic urinary tract infections and other urinary tract infections. Trimethoprim, alone and in combination with other sulfonamides, has been used with varying success in treating malaria. While taking trimethoprim, fluid intake must be kept up to prevent crystalluria. Adverse effects include nausea and vomiting and dermatitis, and, in prolonged therapy, blood studies should be done to warn of any dyscrasias.

USUAL DOSE—two tablets (80 mg trimethoprim, 400 mg sulfamethoxazole per tablet) every 12 hours for 10 - 14 days

281

RANGE—160 mg trimethoprim, 800 mg sulfamethoxazole, to 320 mg trimethoprim, 1.6 gram sulfamethoxazole.

ANTIBIOTICS

Antibiotics are products of living microorganisms which kill or inhibit the growth of other undesirable microorganisms. Beginning with the discovery of penicillin, the field of antibiotics has been developed into a highly specialized one and to describe all the drugs in this group would require too much space.

The term "broad spectrum antibiotic" is becoming more and more prevalent and probably best describes all of the newer antibiotics. Manufacturers are endeavoring to perfect their products so that they will affect the greatest number of disease organisms—the broadest possible spectrum. In a great many instances, they have succeeded admirably; however, the perfect universal antibiotic seems to be a long way off.

Penicillin

Penicillin is the antibacterial substance derived from the mold *Penicillium notatum* or *Penicillium chrysogenum.*

Penicillin has a selective action against certain bacteria. It is chiefly effective against certain strains of aerobic and anaerobic gram-positive organisms. Most gram-negative organisms such as *Escherichia coli, bacillus typhosus,* and the *salmonellae* and certain strains of gram-positive organisms are highly resistant. It is effective against certain spirochetes, molds, and viruses.

Penicillin solutions are most stable at a pH between 5 and 7. They are inactivated by high temperatures. Crystalline penicillin G is stable at ordinary temperatures; however, its solution should be kept refrigerated. Stable liquid preparations have recently been introduced which require no refrigeration, e.g., Benzathine Penicillin G, Bicillin.

TOXICITY. Some patients develop urticarial reactions, serum sickness reaction, dermatitis, and anaphylactic shock. Topical applications may produce sensitivity; therefore, it should not be employed in this manner. This drug may produce serious allergic reactions.

Penicillin is effective in the treatment of:

- Bacterial endocarditis, and pneumococcal infections (baterial pneumonia).
- Hemolytic streptococcic infections with bacteremia and all serious local infections such as cellulitis, mastoiditis, pneumococcal empyema, puerperal sepsis, peritonitis, and endocarditis.
- Clostridial infections such as gas gangrene.
- Anaerobic streptococcic infections.
- Pneumococcic infections of the meninges, pleura, and endocardium.
- Gonococcic infections.
- Antrax.
- Vincent's angina infection.
- Syphilis.

It is effective in the treatment of diphtheria and is prescribed in conjunction with other drugs and with the antitoxin. It is ineffective against typhoid, *Escherichia coli,* infections of the urinary tract, tularemia, tuberculosis, undulant fever, and other diseases caused by gram-negative organisms or viral infections.

Penicillin may be administered parenterally or orally.

CAUTION: Topical application of penicillin is no longer recommended because of the increasing number of instances of sensitization of patients. When it is given orally, a buffer such as sodium citrate, calcium carbonate, aluminum hydroxide gel, kaolin, magnesium oxide, or citric acid should be given to minimize gastric acidity.

Since bacteria may become resistant to penicillin if subjected to sublethal concentrations of the drug, it is essential that effective doses be administered.

Penicillin G Potassium®

ACTION AND USE—Penicillin G may be given orally. This drug is effective against gram-positive bacteria, particularly against streptococcic, pneumococcic, and clostridial infections. It is also effective against gram-negative gonococcic and meningococcic infections. Because many strains of micrococci bacteria have become resistant to penicillin therapy, it is of limited value and other antibiotics are indicated. It is effective in the treatment of bacterial endocarditis and anthrax, syphilis, Vincent's infection, and actinomycosis. It is prompt acting and lasts about three to four hours. For additional information, see the discussion under penicillin.

USUAL DOSE: Oral, 200,000 to 500,000 U.S.P. units 3 or 4 times daily, individualized to specific infection

RANGE: Oral, 200,000 to 2,000,000 U.S.P. units daily
IM, 1,000,000 to 20,000,000 U.S.P. units daily

Penicillin G Procaine
(Depo-Penicillin®)

ACTION AND USE—See penicillin and penicillin G. The action is more prolonged than penicillin G.

USUAL DOSE: 300,000 to 600,000 U.S.P. units every 12 to 24 hours IM.

RANGE: 300,000 to 4,800,000 U.S.P. units I.M. daily

Penicillin G Benzathine
(Bicillin®, Permapen®)

ACTION AND USE—This drug is a complex salt of penicillin. It is relatively insoluble in water and has a rather prolonged action in contrast to the soluble salts of penicillin G. It is absorbed from the gastrointestinal tract and is not destroyed by the gastric juices. Administered intramuscularly, a single injection may produce effective blood levels lasting more than one week. The uses and actions of benzathine penicillin are similar to penicillin. It is particularly indicated whenever prolonged penicillin action is indicated. Hypersensitivity reactions are infrequent.

USUAL DOSE: IM, 1,200,000 to 2,400,000 units in a single dose.
Oral, 400,000 to 600,000 units 4 to 6 times daily

RANGE: IM, 600,000 to 2,4000,000 as a single dose

Phenoxymethyl Penicillin
(Penicillin V Potassium, Pen VK®)

ACTION AND USE—The action and uses of phenoxymethyl penicillin are similar to penicillin. Gastric juices wil not inactivate this preparation as compared to the salts of penicillin G. Symptoms of sensitivity, when administered orally, are infrequent, but similar to those discussed under penicillin. It is the penicillin of choice for oral administration.

DOSE RECOMMENDATION: 400,000 units (250 mg) every 6 hours

RANGE: 200,000 to 1,000,000 units (125 mg to 662 mg)

Cloxacillin Sodium (Tegopen®)

ACTION AND USE—Cloxacillin is an oral antibiotic effective against penicillin-G susceptible and penicillinase resistant strains. Absorption from the gastrointestinal tract is rapid but variable; cloxacillin is relatively stable in gastric acid. Adverse reactions are similar to other penicillins: nausea, vomiting, diarrhea, and allergic dermatitis. Cloxacillin is contraindicated in patients with a known hypersensitivity to penicillins.

USUAL DOSE—250 mg to 1 gram every 6 hours, 1 hour before or 2 hours after meals

RANGE—500 mg to 3 grams

Dicloxacillin Sodium (Dynapen®)

ACTION AND USE—Dicloxacillin is a penicillinase resistant penicillin similar to cloxacillin in its indications and adverse reactions.

USAL DOSE: 500 mg to 1 gram every 6 hours, 1 hour before or 2 hours after meals for 10 days

RANGE: 500 mg to 3 grams daily

Ampicillin (Polycillin®, Amcill®, Omnipen®, Penbritin®)

ACTION AND USE—A synthetic broad spectrum penicillin effective against the usual penicillin-G susceptible gram-positive organisms plus many common gram-negative pathogens. Polycillin is stable in the presence of gastric acid and well absorbed from the gatrointestinal tract, thus providing desirable oral penicillin therapy.

USUAL DOSE: 250 to 500 mg every 6 hours for 10 days

NOTE: As with all penicillin products, check for history of sensitivity or allergic reactions.

Nafcillin Sodium (Unipen®)

ACTION AND USE—Sodium nafcillin is a comparatively new semisynthetic penicillinase resistant pencillin. Although primarily developed as an antistaphylococcic, it is also effective in the treatment of infections caused by pneumococci and Group A *beta*-hemolytic streptococci. Due to this wide gram-positive spectrum, Unipen is particularly suitable for initial therapy in severe or potentially severe respiratory, cutaneous, or other infections before definitive culture results are known and in which staphylococci are suspected.

USUAL DOSE: IM 500 mg every 6 hours; increased to every 4 hours in severe infections
ORAL: 250 - 500 mg every 6 hours for moderate infections; one gram every 4 hours may be necessary in severe infections.

Oxacillin Sodium (Prostaphlin®)

ACTION AND USE—Another synthetic penicillin, it resists inactivation by staphylococcal penicillinase and is acid resistant, therefore it can be conveniently administered orally. A broad spectrum antibiotic used in the treatment of *staphylococcus aureous* infection.

USUAL DOSE: 500 mg every 4 to 6 hours for a minimum of 5 days, 1 gram every 4 to 6 hours in severe infections taken 1 to 2 hours before meals

RANGE: 500 mg to 6 grams daily

Neomycin Sulfate

ACTION AND USE—Neomycin is effective against certain gram-positive and gram-negative bacteria. It has a wider anti-bacterial spectrum than bacitracin, penicillin, or streptomycin. It is administered orally as a preoperative disinfectant in surgery involving the bowel or anus. It is not absorbed by the gastrointestinal tract. It is used by intramuscular injection in certain serious systemic infections caused by gram-negative bacteria and in certain urinary tract infections and micrococcal infections. Neomycin is also used topically for infections of the skin and eye, in ointment or solution form.

SIDE EFFECTS—Serious side effects have been reported in those receiving intramuscular injections of neomycin for several days. These include: partial to total and transient to permanent deafness; vestibular dysfunction; renal damage (casts in urine, microscopic hematuria, and albuminuria); permanent renal shutdown; and increase in serum nonprotein nitrogen.

USUAL DOSE: 700 mg every 4 hours, topical as 0.35% ointment 2 or 3 times daily

RANGE: 1.4 to 8.4 grams

CAUTION: Even topical administration has produced deafness and renal failure.

Bacitracin

ACTION AND USE—Bacitracin is bactericidal and effective against a wide variety of gram-positive organisms including hemolytic and nonhemolytic streptococci, micrococci (staphylococci), and pneumococci, anaerobic cocci and clostridia of the gas gangrene group, and certain meningococci. It is not effective against most aerobic gram-negative bacilli. It is used in the treatment of infections caused by susceptible micrococci failing to respond to penicillin. Bacteria are slow to develop resistance to this drug, and sensitivity is rare. Bacitracin is employed locally by topical application in ointment form or injected intramuscularly or directly into certain abscesses.

USUAL DOSE: IM 10,000 to 20,000 units 3 or 4 times daily; topical as ointment containing 500 units per gram.

Polymyxin B Sulfate

ACTION AND USE—This drug is an antibiotic that is bactericidal for gram-negative microorganisms. It is a second line drug for pseudomonas. It is also used topically for local infections.

SIDE EFFECTS—Dizziness and mild weakness may result, and occasionally albuminuria and nitrogen retention.

USUAL DOSE: topical, as an ointment containing 200,000 units per gram; IM 6250 to 7500 units/kg 4 times a day

Chloramphenicol
(Chloromycetin®)

ACTION AND USE—Chloramphenicol is effective in treatment of Rickettsial diseases and is useful in the treatment of brucellosis, pertussis, staphylococcic infections, and infections caused by *Pseudomonas aeruguinosa, Escherichia coli,* and *Proteus vulgaris.* It is one of the most effective antibiotics against a wide variety of gram-negative organisms and Rickettsia.

The serious and fatal blood dyscrasias and other toxic manifestations that may occur require caution and frequent blood studies.

USUAL DOSE: Oral & IM, 50 mg per kg of body weight in divided doses at 6 hour intervals

Erythromycin
(Erythrocin®, Ilotycin®)

ACTION AND USE—Erythromycin is an effective drug against certain gram-positive bacteria. This drug is similar to penicillin in antibacteria activity and is effective against susceptible penicillin-resistant strains. It is effective against certain beta-hemolytic striptococci, pneumococci, and micrococci in the treatment of intestinal amebiasis. It is primarily used for patients who are sensitive to penicillin.

SIDE EFFECTS—Gastrointestinal disturbances are frequent.

USUAL DOSE: 250 mg every 6 hours or 500 mg every 12 hours

RANGE: 1 to 4 grams daily

Tetracycline Hydrochloride
(Achromycin®, Panmycin®, Tetracyn®)

ACTION AND USE—The action and uses of this drug are similar to chlortetracycline and oxytetracyline. It appears to be useful for topical application treatment of pyogenic infections. It appears to be more stable than the aforementioned tetracycline preparations.

SIDE EFFECTS—Nausea, vomiting, and loose stools may result.

NOTE: Prolonged use of tetracycline results in a supression of the normal intestinal flora of bacteria which may cause an abnormal growth of molds and fungi. Vitamin deficiencies may also result. Staphylococci rapidly acquire resistance to any tetracycline hydrochloride and occasionally have emerged as pathogenic survivors and have established fatal secondary or superinfections.

USUAL DOSE: 1 to 2 grams in divided doses

ANESTHETICS

The history of anesthesia is wrought with drams, tragedy, and serendipity, and its discovery is probably one of the greatest boons to mankind. Generally speaking, anesthesia means "without feeling"; consequently, we apply the word to drugs which produce insensibility to pain. The field today is a highly specialized one.

General Anesthesia and Anesthesia Induction Agents

Some appreciable advances have been made in the field of general anesthesia, the emphasis being on modified equipment which allows for better mixing and control, plus much greater safety from explosion. Since general anesthetics are usually gas or vapor and are administered by inhalation, administering them remains a highly specialized field and should never be undertaken by a hospital corpsman without the supervision of a medical officer. There may be times when you as a hospital corpsman will be called upon to administer general anesthesia, therefore it will behoove you to understand its principles.

Nitrous Oxide

ACTION AND USE—Nitrous oxide is usually employed with an adequate amount of oxygen in general anesthesia of a somewhat prolonged nature. It may produce a condition during which the patient may laugh and become quite talkative. It is commonly used in dentistry or as a preinduction agent to other general anesthetics. It does not produce adequate relaxation, therefore, it is most often used in conjunction with other anesthetic agents.

CAUTION: High concentrations of nitrous oxide may cause cyanosis and asphyxia.

Cyclopropane (Trimethylene)

ACTION AND USE—Cyclopropane was introduced in 1930 as a safe and potent anesthetic. Induction with this gas is more pleasant than with ether. There is no respiratory irritation or laryngospasm, and no respiratory depression with deep surgical anesthesia. Blood pressure is little affected with anesthetic concentrations. The cardiac rate may be slowed during the surgical stage. Muscular relaxation is usually quite sufficient. Administered expertly, cyclopropane can be used safely in almost every type of operation, including obstetrical surgery. Its use allows adequate oxygen throughout all depths of anesthesia,and there is a wide margin of safety between anesthetic and toxic concentrations.

CAUTION: Cyclopropane is highly flammable. A mixture of it with oxygen or air will explode when ignited. Because it is highly flammable, caution must be observed in the use of cautery.

Halothane (Fluothane®)

ACTION AND USE—Halothane is used for inhalation anesthesia in every known operative procedure in patients of all ages. Use of Halothane permits high oxygen concentration and use of cautery; virtually non-toxic, recovery is rapid and remarkably free of excitement, nausea, and vomiting. It is non-flammable and non-explosive.

CAUTION: Sudden exposure to high or unknown concentration may rapidly produce dangerous overdosages. Accurate and proper administration by trained personnel is therefore important.

Ethylene

ACTION AND USE—Ethylene is a rapid, smooth, and pleasant induction agent which causes good muscular relaxation.

CAUTION: Ethylene is highly flammable. Do not expose to open flame.

Fentanyl Citrate and Droperidol (Innovar®)

This combination product has the narcotic effect of fentanyl citrate with the tranquilizing effect of droperidol. Due to the self-potentiating effect of the combined narcotic and tranquilizer, extreme caution must be used in patients with any predisposition to respiratory problems. The combination often leads to respiratory depression and may require assisted ventilation or tracheal intubation.

USUAL DOSE: 0.5 to 2.0 cc I.M. 45 to 60 minutes prior to surgery.

Local Anesthetics

These are drugs which produce insensibility to pain in one specific area or locality of the body, without loss of consciousness or mental capacity. The majority of these drugs are administered either parenterally, by instillation, or by topical application.

Here again, as a hospital corpsman, you may be called upon to perform minor surgical procedures which necessitate administering local or topical anesthetics. The process is not a simple one; however, if you thoroughly understand the correct procedures, the nature of the drug you use as an anesthetic, and the precautions to be observed, administering local anesthesia need not be insurmountable.

By observing good preoperative and sterile technique, half the job is accomplished; the danger of infection due to poor technique is always present. Always inject the anesthetic into sound tissue; diseased, inflamed, or necrotic tissue does not function and therefore hinders the proper utilization of the anesthetic. Never inject the anesthetic into an open wound, since the injured tissue does not respond to anesthesia very well, and if a suturing procedure is involved, injecting the anesthetic into the open wound will tend to distort the area and prevent proper closing.

When using anesthetics which contain epinephrine or any other vasoconstrictor, remember to avoid injection into the fingertips, toes, or any distal appendages, the vasoconstriction may close the distal capillaries, with possible permanent injury to the member due to impaired circulation.

Cocaine Hydrochloride

ACTION AND USE—As a local anesthetic, cocaine is used ONLY by topical application. It penetrates the mucous membrane rather readily. Cocaine is a vasoconstrictor and mydriatic; these properties are not found in other local anesthetics. It is seldom used in the treatment of the eye in high concentrations because of its mydriatic effect and harmful action on the cornea. For this reason it has been replaced by certain synthetic drugs. The sale of cocaine is regulated by the Comprehensive Drug Abuse Prevention and Control Act of 1970.

TOXICOLOGY—Acute poisoning. The symptoms are quickened respiration and pulse rate, excitement, dilated pupils, dry throat, headache, vertigo, confusion, and convulsions. The stimulation is succeeded by depression, and death may occur from respiratory failure.

TREATMENT—The treatment consists of gastric lavage, symptomatic treatment (with particular attention to respiration and circulation), and intravenous injections of short-acting barbiturates.

CAUTION: It is never administered by injection because it is a general protoplasmic poison.

FOR EXTERNAL USE—Topical as a 2 to 20% solution applied to mucous membranes.

Procaine Hydrochloride (Novocain®)

ACTION AND USE—Procaine is administered only by injection. It is about one-fourth as toxic as cocaine when injected. It is used for infiltration anesthesia, nerve block, or spinal anesthesia, in doses of 100 to 150 mg. For nerve block a 1 or 2% solution is usually employed.

USUAL DOSE: Infiltration: 350 to 600 mg of a 0.25 to 0.5% solution; peripheral nerve block: 25 to 50 ml of a 1% solution; epidural: 25 ml of a 1.5% solution.

RANGE: Up to 600 mg

Lidocaine Hydrochloride (Xylocaine Hydrochloride®)

ACTION AND USE—It is considerably more potent than procaine hydrochloride. It may be combined with epinepherine hydrochloride to delay absorption and prolong action. Local toxic effects are considered rare as compared to procaine hydrochloride. It is used for infiltration and block anesthesia in dental and general surgical procedures and is effective when applied topically to mucous membranes.

CAUTION: Total dosage injected in 24 hours should not exceed 0.5 gram per patient when used with epinephrine hydrochloride.

USUAL DOSE: Infiltration anesthesia, concentration of 0.5%, 50 ml; Dental use, 2% solution with epinephrine hydrochloride 1:100,000

FOR EXTERNAL USE: Topically 250 mg as a 2% jelly or 2 to 4% solution to mucous membranes

Mepivacaine Hydrochloride Injection (Carbocaine®)

ACTION AND USE—Local anesthetic at least as potent as lidocaine, for infiltration and nerve block only. Produces rapid, marked, and prolonged local anesthesia with a minimum of side effects.

USUAL STRENGTH: 1 to 2%, with or without epinephrine

NOTE: This solution is not intended for spinal anesthesia or dental use.

Dibucaine Hydrochloride (Nupercaine Hydrochloride®)

ACTION AND USE—Dibucaine hydrochloride is used as a topical anesthetic on mucous membranes, for infiltration, and as a spinal and caudal anesthetic by injection.

CAUTION: In view of its high toxicity, it should be employed only by those thoroughly familiar with the drug and the techniques of local anesthesia.

USUAL DOSE: See package insert; individualized to patient.

Ethyl Aminobenzoate (Benzocaine, Anesthesin)

ACTION AND USE—Because of its low solubility, ethyl aminobenzoate is usually prescribed as a local anesthetic in the form of dusting powders for relief of pain in wounds, in lozenges for throat irritations, and in ointment for itching in various skin diseases.

Hexylcaine Hydrochloride (Cyclaine Hydrochloride®)

ACTION AND USE—Hexylcaine hydrochloride is a soluble local anesthetic. It is employed for surface infiltration and spinal anesthesia. It is also used for nerve block. Hexylcaine has a rapid onset and is longer acting than an equal concentration of procaine when used for infiltration and nerve block.

DOSE RECOMMENDED: Infiltration anesthesia, 5 to 65 ml of 1% solution
Nerve block, 2 to 10 ml of 1% solution
Surface anesthesia, up to 5% concentration

Proparacaine Hydrochloride (Ophthaine®, Ophthetic)

ACTION AND USE—A topical ophthalmic anesthetic, suited for virtually every ophthalmic procedure requiring topical anesthesia. Extremely rapid anesthesia without the usual preliminary burning sensation. Fairly long lasting.

AUTONOMIC DRUGS

The autonomic nervous system, also called the vegetative, visceral, or involuntary nervous system, controls the autonomic functions of the body. Drugs which affect the autonomic system are highly specialized and therefore classed according to their effect.

NOTE: Refer to the section on the Autonomic Nervous System in chapter 3 for further discussion.

Parasympathomimetic Drugs

These drugs, also called cholinomimetics, stimulate the structures controlled by the parasympathetic nerves. They are either direct acting or indirect acting.

Physostigmine Salicylate (Antilirium)

ACTION AND USE—Physostigmine is specific for anticholinergic (atropine) poisoning. It is indirect acting, and is used in the treatment of glaucoma and myasthenia gravis, and increases intestinal peristalsis.

USUAL DOSE: 0.5 - 2.0 mg IM or IV

Neostigmine Methylsulfate (Prostigmin®)

Neostigmine acts like Physostigmine by inhibiting cholinesterase. During World War II, it was used as a nerve gas and later as an insecticide. It is used primarily for the relief of postoperative abdominal distention but also for the symptomatic control of myasthenia gravis and for urinary retention.

USUAL DOSE: 1 ml of a 1:2000 solution (0.5 mg) SC or IM. q 4-6 hours

Neostigmine Bromide (Prostigmin®)

This drug is used for the same purposes as neostigmine methylsulfate but primarily used in the treatment of myasthenia gravis.

USUAL DOSE: 15 mg, 10 times a day at regular spaced intervals.

Bethanechol Chloride (Urecholine®)

ACTION AND USE—Bethanechol is the drug of choice for urinary retention. It causes nonvascular smooth muscle contraction and exocrine gland stimulation.

USUAL DOSE—10 to 30 mg 3 or 4 times a day

Pilocarpine

Pilocarpine is a direct acting, natural alkaloid with the same mechanism of action as bethanechol except it causes marked diaphoresis and adrenal medulla stimulation. Its only indication is glaucoma.

Sympathomimetic Drugs

These drugs stimulate the structures controlled by the sympathetic (or adrenergic) nerves and start adrenal medullary discharge of epinephrine.

Epinephrine (Adrenalin®)

ACTION AND USE—Epinephrine causes relaxation of smooth muscle, which decreases gastrointestinal tone and motility, and relaxes bronchial muscles. It constricts the blood vessels in some areas and dilates them in others but overall has a net vasodilating effect. It shunts blood from non critical areas to the skeletal muscles for greater effect for "Flight or Fight." It accelerates the heart rate, increases cardiac output, and possibly alters ventricular rhythms. An IV injection causes an almost immediate rise in systolic blood pressure. When applied to the eye, it will cause contraction of the pupil. It causes increased glycogenolysis in the liver, which is the breakdown of glycogen to glucose, giving a higher level of blood sugar. (Caution should be used when given to diabetics.) Epinephrine is the drug of choice of mild to moderate acute attacks of asthma. It is also used for treatment of certain allergic disorders such as urticaria, serum reactions, and hay fever, and in the treatment of cardiac arrest and hypotension due to spinal anesthesia.

Epinephrine is used to control hemorrhage from minor cuts, although it is not effective when arteries or large veins are involved. It is used in conjunction with local anesthetics to prolong their action, lessen the possibility of hemorrhage, and to decrease the chance of the local anesthetic diffusing into surrounding tissues. It is also given during spinal anesthesia to maintain blood pressure.

NOTE: See the section on Vasoconstriction Drugs in this chapter for further discussion.

USUAL DOSE: Cardiac—0.5 ml diluted to 10 ml with Sodium Chloride I.V.

Phenylephrine Hydrochloride (Neo-Synephrine Hydrochloride®)

ACTION AND USE—This drug has a vasopressor action when injected or taken orally. When applied topically to nasal mucosa or conjunctiva, it acts as a vasoconstrictor, reducing swelling and congestion. It is often combined with local anesthetics in a similar manner as epinephrine hydrochloride.

NOTE: See the section on Vasoconstrictor Drugs in this chapter for further discussion.

USUAL DOSE: SC or IM, 5 mg 3 times a day

RANGE: 1 to 2 mg

FOR EXTERNAL USE—Topically 0.1 ml of a ¼%to 10% solution to mucous membranes.

Parasympatholytic Drugs

Also called anticholinergic drugs, they block responses to cholinergic nerves and are used primarily to relax the smooth muscles of the gastrointestional tract. Their effects on the eyes, heart, and other organs of the body will be described in detail under the individual drugs.

Atropine Sulfate (Alkaloid obtained from Belladonna)

ACTION AND USE—Atropine has two major actions: (1) on the central nervous sytem, it stimulates the medulla and higher centers and causes an increase in respiration; and (2) on the smooth muscles and secretory glands, it relaxes the muscles of the intestinal tract, bronchi, ureter, biliary ducts, and gall bladder. It inhibits glandular secretions causing dryness of the nose, throat, bronchi, mouth, and skin.

Atropine has a mydriatic effect on the pupil of the eye and causes a paralysis of accommodation. It may also cause a slight rise in body temperature. It has a dulling effect on the sensory nerve endings and is often used as an anodyne. Atropine is used as a mydriatic and cycloplegic in opthalmology, as an anhidrotic (checking the secretion of sweat), in large doses as a circulatory stimulant, and as a respiratory stimulant in certain poisonings. It is a physiologic antidote for eserine, prostigmine, pilocarpine, nerve gases, and muscarine. This drug is used to relax spasms of the intestinal tract and those of the bronchi in bronchial asthma. Atropine is given with morphine to overcome the respiratory depressant effects of morphine. It is used preoperatively to reduce salivary and bronchiole secretions. It is given to treat motion sickness and as a nasal decongestant.

DOSE RECOMMENDED—Atropine Sulfate as 0.5 mg oral, IV or SC; For external use—Topical, as 0.5 to 1% solution or ointment

RANGE: 0.3 to 1.2 mg

MIMINUM LETHAL DOSE—adults 80-130 mg
children 10-20 mg

Propantheline Bromide (Pro-banthine®)

ACTION AND USE—This drug is used for its anticholinergic effects in the treatment of peptic ulcer and hypermotility states of the G.I. tract. It has a similar action to atropine in that it reduces gastric secretions.

USUAL DOSE: 15 mg 4 times a day

RANGE: Up to 60 mg 4 times a day

Sympathoplegic Drugs

Also called adrenergic blocking agents, these drugs block the action of the sympathomimetic amines or block sympathetic outflow. The alpha-adrenergic blocking agents block the vasoconstricting effects of epinephrine and norepinephrine, thereby lowering the blood pressure. The beta-adrenergic blocking agents block the cardiac and vasodilating effects of epinephrine and the cardiac effects of norepinephrine, thereby lowering the force of cardiac contractions and decreasing the heart rate.

Phentolamine (Regitine®)

ACTION AND USE—Phentolamine is a potent Alpha-adrenergic blocker used in the diagnosis and treatment of pheochromocytoma (Regitine Blocking Test) and for prevention of local necrosis due to accidental paravenous injection of norepinephrine in treatment of shock.

USUAL DOSE: 50 mg 4 to 6 times a day

Propranolol HC1 (Inderal®)

Propranolol is a pure beta antagonist which blocks beta agonist effects on the heart. It is useful in cardiac arrhythmias because of its quinidine-like effects. Propranolol will slow the atrial rate in atrial tachycardia. Cardio-tonic glycoside induced arrhythmias are better controlled by Propranolol than by potassium (K^+), (although any K^+ deficit should be corrected). Propranolol is also used in anticipation of DC countershock and for preventing anginal pain (due to coronary atherosclerosis) and in the treatment of hypertension. Beta-blockers such as propranolol will cause bronchiole constriction even in normal individuals and are contraindicated in asthmatics.

USUAL DOSE: the dosage is different for each indication

Hypertension—80 mg b.i.d.

Anginapectoris—40 mg q.i.d.

Arrhythmias—10-30 mg t.i.d. or q.i.d. (a.c. & h.s.)

Methyldopa (Aldomet®)

ACTION AND USE—The principle use of methyldopa is in the treatment of essential hypertension. Common side effects in initial therapy include sedation and drowsiness. Adverse reactions include bradycardia; orthostatic hypotension; edema resulting from salt and water retention, which is usually relieved by a diuretic; nausea; vomiting; and possible depression and reversible mild psychosis.

USUAL DOSE: 500 mg to 2.0 g in 2 to 4 divided daily doses

Tolazoline Hydrochloride (Priscoline Hydrochloride®)

ACTION AND USE—Tolazoline hydrochloride is a potent sympathoplegic drug. It is reputed to block impulses by sympathetic nerves and blocks the vasoconstrictive action of epinephrine and levarterenol. This drug also produces a dilating effect on small blood vessels. It is useful in treatment of Buerger's disease, frostbite, complications of diabetes arising from peripheral vascular causes, Raynaud's disease, and in ulcers of the extremities.

USUAL DOSE: 50 mg 4 times a day

Oxytocics

Oxytocics or ecbolics are drugs which produce a rhythmic contraction of the uterus. Their action is selective for the uterus, although other smooth muscles are affected. The most important oxytocics are the alkaloids of ergot (ergonovine and ergotamine) and oxytocin, the oxytocic principle extracted from the posterior pituitary.

Ergotamine Tartrate (Gynergen®)

ACTION AND USE—Ergotamine has a variable action on the central nervous system. Caffeine acts as a synergist and is available in tablet form in combination with ergotamine tartrate. Ergotamine tartrate is the drug of choice for relieving migraine headache. It increases the motor activity of the uterus but is less efficient than ergonovine and is seldom used as a uterine stimulant.

NOTE: This drug is specific for migraine. It is listed in this section for convenience of classification.

USUAL DOSE: Oral, 2 mg followed by 1 mg every ½ hour;
I.M. 0.25 mg, repeated in 1 hour if needed

RANGE: Oral 1 to 5 mg

Oxytocin Injection (Pitocin®)

ACTION AND USE—This is the water soluble principle of the posterior lobe of the pituitary gland which possesses oxytocic properties. It is used to induce labor or maintain contractions. It is also given immediately post partum to prevent hemorrhage due to placenta separation.

USUAL DOSE: I.V., 1-2 ml, repeated in 30 minutes if necessary

RANGE: 0.3 to 2 ml

Antihistamines

Histamine, a substance found in the tissues, has been demonstrated to have an important role in allergenic reactions. This fact has led to the development of compounds that oppose its action. These drugs apparently compete with the histamine at the site of the action.

The drugs listed here are only a few; however they are representative of the entire group.

Diphenhydramine Hydrochloride (Benadryl®)

ACTION AND USE—Diphenhydramine hydrochloride has the ability to antagonize the pharmacologic effects of histamine. It reduces the broncho-constriction produced by histamine. This drug is used in the symptomatic treatment of urticaria, allergic rhinitis, serum reactions, and other allergic conditions. It will sometimes relieve the itching of infantile eczema. The principal side effects are drowsiness, dizziness, and gastrointestinal upset.

USUAL DOSE: 25 mg up to 4 times a day

RANGE: 25 to 100 mg

Tripelennamine Hydrochloride (Pyribenzamine®)

ACTION AND USE—The therapeutic action of tripelennamine hydrochloride is similar to that of diphenhydramine hydrochloride. It has local anesthetic properties. It may cause gastrointestinal distress and drowsiness.

USUAL DOSE: 50 mg 1 or 2 times a day

RANGE: 25 to 75 mg

Chlorpheniramine Maleate (Chlor-Trimeton®)

ACTION AND USE—This drug is similar in action to diphenhydramine and has fewer side effects.

USUAL DOSE: 4 mg up to 4 times a day

RANGE: 2 to 8 mg

Meclizine Hydrochloride (Antivert®, Bonine®)

ACTION AND USE—Meclizine hydrochloride is an antihistamine drug of long duration of action. It is administered for relief of motion sickness. It is contraindicted in pregnancy. Common side effects are drowsiness and blurring of vision.

USUAL DOSE: 25 mg once daily

RANGE: 25 to 50 mg

Dimenhydrinate (Dramamine®)

ACTION AND USE—The actions of dimenhydrinate are similar to the other antihistamine compounds; however, this drug enjoys its greatest usefulness in the prevention and treatment of motion sickness. It is also useful in controlling nausea and vomiting in connection with radiation sickness, hypertension, and dysfunctions associated with streptomycin therapy. This drug has been used as an antiemetic agent to alleviate postoperative and postanesthetic nausea and vomiting.

USUAL DOSE: 50 mg 4 times a day

RANGE: 50 to 100 mg

BIOLOGICAL AGENTS

Biologicals are agents which are prepared from living organisms or their products. The chief purpose served by these preparations in the Navy is the immunization of personnel against infectious disease. They may, however, be utilized in the treatment of disease or act in a diagnostic capacity. Dosage and routes of administration are described in BUMEDINST 6230.1 series.

Biologicals include serums, viruses, toxins, antitoxins, antigens, and bacterial vaccines.

Manufacturers of these products must be licensed by the Secretary of the Treasury. Their procedures are closely examined by the U.S. Public Health Service.

The label which must be placed on each package will bear the name, address, and license number of the manufacturer. It will also list the name of the product, lot number, date of manufacture or expiration date, period of potency, and the minimum potency or the fact that there is no standard of potency.

Diphtheria Antitoxin

Diphtheria antitoxin is a transparent or slightly opalescent liquid, nearly colorless, and having a very slight odor due to its preservative. It is a sterile solution of antitoxic substances obtained from the blood serum or plasma of a healthy animal, usually a horse, that has been immunized against diphtheria toxin.

Tetanus Antitoxin

Tetanus antitoxin is a sterile solution of antitoxic substances which are usually obtained from the blood serum or plasma of a healthy horse which has been immunized against tetanus toxin or toxoid. It contains not more than 0.4% cresol or 0.5% phenol as a preservative. It is slightly opalescent with a yellow, brown, or greenish color, depending upon the manufacturer. There will be a slight odor of the preservative used.

Tetanus and Gas Gangrene Antitoxins

Tetanus and gas gangrene antitoxins injection is a sterile solution of antitoxic substances obtained from the blood of healthy animals that have been immunized with the toxins of *Clostridium tetani, Clostridium perfringens,* and *Clostridium septicum.* It presents the same appearance as the tetanus antitoxin. The potency of the antitoxin is expressed in antitoxic units and the units are those of the *tetanus, perfringens,* and *vibrion septique* antitoxins prescribed by the National Institute of Health.

It is a specific against tetanus and gas gangrene caused by one or more of the organisms mentioned above.

Each package of the antitoxin contains not less than 1500 units of tetanus antitoxin and not less than 2000 units of the other antitoxins.

Diphtheria Toxoid

Diphtheria toxoid is a sterile solution of formaldehyde treated products of growth of the diphtheria bacillus, *Corynebacterium diphtheriae.*

It is a clear, brownish yellow, or sightly turbid liquid with a broth like odor or a slight odor of formaldehyde.

Alum Precipitated Diphtheria and Tetanus Toxoids Combined

This is a sterile suspension of these toxoidal agents. The potency and proportion of the toxoids are such as to provide an immunizing dose of each toxoid in the total dosage prescribed on the label. The suspension contains not more than 15 mg of alum in the volume stated on the label for one injection. The color of the suspension will vary from white to gray or pink, and a slight odor of the preservative used will be present.

Alum Precipitated Diphtheria and Tetanus Toxoids and Pertussis Vaccines Combined

Alum precipitated diphtheria and tetanus toxoids and pertussis vaccines combined is a markedly turbid, whitish liquid. It is nearly odorless or may have a slight odor of the preservative. It is a sterile suspension of the precipitate obtained by treating a mixture of diphtheria toxoid, tetanus toxoid, and pertussis vaccine with alum, and combining in such proportions as to insure an immunizing dose of each in the total dosage as listed on the label.

Tetanus Toxoid

Tetanus toxoid is a sterile solution of the growth of tetanus bacillus, *Clostridium tetani,* which has been treated with formaldehyde.

It is a brownish yellow or slightly turbid liquid usually having the distinctive odor of formaldehyde.

Alum Precipitated Tetanus Toxoid

Alum precipitated tetanus toxoid is a sterile suspension of tetanus toxoid precipated by alum from a formaldehyde treated solution of the products of growth of the tetanus bacillus. It contains a non-phenolic antibacterial agent and not more than 15 mg of alum per injection.

Cholera Vaccine

Cholera Vaccine is a suspension of killed cholera vibrios, *Vibrio comma,* in a suitable diluent, usually isotonic sodium chloride solution. It is prepared from *Inaba* and *Ogawa* strains of a highly antigenic nature. The vaccine presents a turbid appearance, and there may be a slight odor due to the phenol or creosol preservative used.

On storage, autolysis may occur so that the vaccine may become almost as clear as water.

Poliovirus Vaccine Live, Oral, Trivalent (Sabin)

ACTION AND USE—This vaccine is indicated for the prevention of poliomyelitis caused by types 1, 2, and 3 polioviruses.

NOTE: UNDER NO CIRCUMSTANCES SHOULD THIS VACCINE BE ADMINISTERED PARENTERALLY.

STORAGE—To maintain potency it is necessary to store the vaccine in the freezer compartment of the refrigerator. It should be noted that certain forms of this vaccine will remain fluid at temperatures above minus 14° Centigrade. If frozen, after thawing, agitate the vaccine to insure homogeneity of contents prior to use. Once the temperature rises above 0 degrees Centigrade, the vaccine MUST BE USED WITHIN SEVEN DAYS. During this period it must be stored below 10 degrees Centigrade.

Yellow Fever Vaccine

Yellow fever vaccine is a dull, light-orange colored, flaky or crust-like desiccated mass which requires rehydration immediately before use.

The vaccine is prepared from a virus-infected chick embryo and is the living virus of an attenuated strain of the yellow fever virus. Yellow fever vaccine may be acquired only from activities listed in current instructions.

CAUTION: Yellow fever vaccine must be stored at or below 0 degrees C. until rehydration is effected with sterile sodium chloride injection U.S.P.

Typhus Vaccine

A slightly turbid, colorless or reddish tinged liquid having a slight odor indicative of the agent utilized to purify the rickettsial suspension.

It is derived from a developing embryo of a domestic fowl in which the rickettsial organisms have been introduced. The rickettsiae are killed by addition of not more than 0.1% formaldehyde and may contain an antibacterial agent.

Typhoid and Paratyphoid

Typhoid and paratyphoid vaccine is a sterile solution of killed typhoid bacilli, *Salmonella typhosa;* paratyphoid "A" bacilli *Salmonella paratyphi;* and paratyphoid "B" bacilli *Salmonella schottmulleri.* The solution may contain 0.5% phenol or 0.4% cresol used as a preservative.

The vaccine presents a turbid, whitish appearance, and may have a slight odor due to the preservative. It is recommended that typhoid and paratyphoid vaccine be stored at 2 to 10 degrees C. prior to use.

Plague Vaccine

Plague vaccine is a sterile suspension of killed plague bacilli *Pasteurella pestis,* in an isotonic solution. The strain of bacilli used has been selected for its high antigenic efficiency. The plague vaccine is a turbid, whitish liquid which may have a slight odor of its preservative agent.

Diphtheria Toxoid and Pertussis Vaccine Combined

Diphtheria toxoid and pertussis vaccine combined is a sterile mixture of such proportions of the agents to insure an immunizing dose of each.

It is a more or less turbid, whitish liquid with little or no odor. The presence of any precipitate is reason to suspect contamination.

Influenza Virus Vaccine

The influenza virus vaccine is prepared from the allantoic fluid of incubated fertile hen eggs. It is a slightly hazy fluid, which is the result of slight amounts of egg protein. Its color varies from gray to very faint red, dependent upon the method of manufacture.

The duration of immunity is probably no longer than a few months, which necessitates repeating the inoculation prior to the expected seasonal occurrence.

Do not inoculate individuals who are known to be sensitive to eggs or egg products, or personnel suffering from upper respiratory infections.

Dried Smallpox Vaccine (Dryvax®)

ACTION AND USE—Dried smallpox vaccine is prepared directly from calf lymph, purified, concentrated, stabilized, and dried by lyophilization. Polymixin B, streptomycin, and neomycin are added during processing, and trace amounts of these drugs may be present in the final product. Dried smallpox vaccine is much more stable than the conventional liquid; when stored at or below 25 degrees Centigrade, it retains its full potency for 18 months. When reconstituted, it retains its full potency for 3 months, if kept below 4 degrees Centigrade, preferably 0° C.

FACTORS TO BE REMEMBERED IN CONNECTION WITH BIOLOGICALS

1. Acquisition. Most immunizing agents which are used in routine procedures may be obtained through normal supply channels. Yellow fever vaccine must be ordered from activities which have been designated as supply points for this biological.

2. Storage. Biologicals will be stored in a cool, dry, and preferably dark place. Yellow fever vaccine must be maintained in a frozen state until prepared for use.

3. Examination. All biological products should be examined periodically, and a minute examination for deterioration will be held immediately preceding their use.

EXAMINATIONS OF PARENTERAL SOLUTIONS

Solutions will have been examined at least three times at the activity at which they are ultimately used:

1. Upon receiving the solution
2. Periodically while in storage
3. Immediately preceding use

Parenteral solutions, unless the label states otherwise, must be free of turbidity or undissolved material. All solutions should be inverted and gently swirled in order to bring any sediment or particulate matter into view. A well illuminated black or white background will facilitate this examination.

Parenteral solutions may be unfit for use because of:

1. deterioration from prolonged storage.
2. accidental contamination occurring upon original packaging.
3. defects which may develop in containers or seals.

There is no set rule which can be applicable as regards any of these factors. Therefore, to ensure suitability for use, a regimented program of inspection is necessary.

TOXICOLOGY

Toxicology is the science of poisons. It is concerned with the detection, isolation, and quantitative estimation of poisons, their chemical and physiologic effect on the ordinarily healthy organism, and the antidotes for their toxic effects.

A poison is a substance which may produce death, serious illness, or harmful effects when introduced into the body in a relatively small quantity.

The effects of poisons may be local or remote, and some poisons have both a local and remote effect. LOCAL EFFECT means direct action on the part to which the poison is applied, such as corrosion and irritation; REMOTE EFFECT means the action of the poison on some organ remote from the site of application or point of introduction. Sometimes, a poison shows no effect or only a slight one, until several doses have been taken. Then suddenly, an effect is produced which nearly equals that produced by taking the whole amount at one time. This is known as CUMULATIVE EFFECT.

The effect of a poison depends upon its solubility, the method of its introduction into the body, and the rapidity of its absorption into the system. The method of introduction may determine its toxicity. For example, snake venom taken into the mouth and perhaps even into the stomach during first aid treatment of snakebite is not ordinarily harmful, but snake venom injected hypodermically is extremely poisonous.

There are various ways in which poisons may be introduced into the body, the most common being by mouth, inhalation, and injection. Poisons taken by mouth enter the circulation through absorption from the stomach and intestine, and those inhaled enter the circulation through the air passages and lungs. When introduced by hypodermic injection or by injection into the urethral, rectal, or vaginal orifices, poisons enter the circulation through absorption from the body tissues in those areas. If the injection is intravenous, the poisons are introduced directly into the bloodstream. Poisons may also be introduced by application to open wounds and to the unbroken skin. After entering the circulation, a poison is carried by the blood to the tisues and organs susceptible to its action and attacks them.

Most of the excretion of poisons from the body occurs in the kidneys, lungs, liver, gastrointestinal tract, and skin. Poisons may be excreted from the system unchanged or in the form of other compounds into which they have been transformed by the action of the various body organs and tissues. The most damaging effects of some poisons are found at the points of excretion, as in the kidneys and colon in poisoning by mercuric chloride (bichloride of mercury).

Various conditions of the individual may modify the actions and effects of poisons on the body. The age of the person makes a great deal of difference, young children being far more susceptible to poisons than adults. Conditions caused by poisons will vary because of personal idiosyncrasy; that is to say, some persons by nature are unusually sensitive to certain poisons, while others possess a natural tolerance for certain poisons that is not the result of habitual use. Through habitual use of certain poisons, especially narcotics, most persons may become so accustomed to their effects that they are not poisoned when taking doses that would ordinarily prove lethal in the unaddicted. It occasionally happens, however, that continual external use of chemical substances results in hypersensitivity.

The actions of poisons may be considerably modified by disease, some diseases increasing and others lessening the action of poisons. In the latter case, large doses are usually required to produce the desired effect.

Poisoning may be either acute or chronic. Acute poisoning is the condition brought on by taking one overdose of poison. Chronic poisoning is the condition brought on by taking repeated doses of a poison or as the result of the absorption of the poison over a long period of time. Matchmakers, barometer and thermometer makers, painters, and wallpaper hangers are some of the occupational groups subject to chronic poisoning from phosphorous, mercury, lead, and arsenic respectively.

CLASSIFICATION OF POISONS

Gaseous Poisons

These poisons are present in the gaseous state and if inhaled, destroy the capability of the blood as a carrier of oxygen and irritate or destroy the tissues of the air passages and lungs. When in contact with the skin and mucous membranes, gaseous poisons produce lacrimation, vesication, inflammation, and congestion. Examples are carbon monoxide, carbon dioxide, hydrogen sulfide, sulfur dioxide, nitrous oxide (laughing gas), nitric oxide, ammonia gas, chlorine gas, bromine vapors, and war gases.

Inorganic Poisons

Inorganic poisons fall into two classes: (a) Corrosives, which are substances that rapidly destroy or decompose the body tissues at point of contact. Some examples are hydrochloric, nitric, and sulfuric acids in concentrated form; phenol; sodium hydroxide; potassium hydroxide; lye (which is a technical grade of sodium or potassium hydroxide); and iodine. (b) Metals and their salts, which are corrosive and irritant locally, but whose chief action occurs after absorption when they damage internal organs, especially those of excretion. Some examples are arsenic, antimony, bismuth, copper, iron, lead, mercury, radioactive substances, and tin.

Alkaloidal Poisons

These poisons are nitrogenous plant principles which produce their chief effect on some part of the central nervous system. Some examples are aconitine (since this alkaloid is seldom employed in modern therapy, the interest here is chiefly toxicologic), atropine, cocaine, morphine, physostigmine (eserine), and strychnine.

Nonalkaloidal Poisons

These poisons include various chemical compounds, some obtained from plants, having hypnotic, neurotic, and systemic effects. Some examples are the barbiturates, salicylates, trinitrotoluene (TNT), acetophenetidin, digitalis, castor oil, oleoresin of male fern, turpentine, cantharides, and aspirin.

EFFECTS AND SYMPTOMS OF POISONS

For convenience of study, the following general classification of poisons according to their effects on the body and the general symptoms of poisoning will be used.

Corrosives

Corrosives are substances which rapidly destroy or decompose the body tissues at point of contact. Note: See (a) under Inorganic Poisons, above.

GENERAL SYMPTOMS—Immediately, if taken by mouth, there is burning pain in the mouth with severe burning pain in the esophagus and stomach. This is followed by retching and vomiting; the stomach contents are mixed with dark colored liquids and shreds of mucous membrane from the mouth, esophagus, and stomach. The inside of the mouth is corroded and the lips present a characteristic stain if an acid has been used. Swallowing is very difficult, respiration is impeded, the abdomen is tender and distended with gas, the temperature is high, and the facial expression shows anxiety and great suffering.

Irritants

Irritant poisons are those agents which do not directly destroy the body tissues but set up an inflammatory process at the site of application or contact. Some examples are potassium nitrate, ferrous sulfate, silver nitrate, arsenic, and phosphorus.

GENERAL SYMPTOMS—Nausea, vomiting, and purging (frequently the vomited matter and stools contain blood); pain and cramps in the abdomen. In some cases, there is inflammation of the urinary tract.

Neurotics

Neurotics are poisons which act on the brain, spinal cord, and the central nervous system. Some examples are opium, hydrocyanic acid (2% solution is called prussic acid), ether, chloroform, aconite, nux vomica, belladonna, ethyl and methyl alcohol, and the barbiturates.

GENERAL SYMPTOMS—Symptoms may be divided into two subclasses:

DEPRESSANTS, which produce symptoms characterized by a period of exhilaration followed by drowsiness and stupor; slow and stertorous breathing; cold, clammy skin; cyanosis; slow pulse; muscular relaxation; dilated or contracted pupils; and insensibility to external impressions.

EXCITANTS, which produce symptoms characterized by rapid and feeble pulse; delirium; hot and dry skin; a sense of suffocation and the inability to breathe; shuddering and jerking of muscles; dilated or contracted pupils; distorted vision; and sometimes convulsions and tetany (as in the case of strychnine poisoning).

Gaseous Poisons

Poisons present in the gaseous state which, if inhaled, destroy the oxygen carrying property of the blood and irritate the tissues of the lungs and air passage or if in contact with the skin or mucous membranes, are highly irritating.

GENERAL SYMPTOMS—Irritation and corrosion of the respiratory tract, with resultant bronchitis (either mild or severe); irritation of the eyes, mouth, stomach, and kidneys.

Food Poisoning

Food poisoning can cause acute attacks of illness in more people in a short time than any other condition. The term food poisoning is conventionally divided into two types, FOOD INTOXICATION and FOOD INFECTION.

Food intoxication is due to a specific toxin produced outside the body; for example, the toxin in *Clostridium botulinum.* Other organisms cause food intoxication by producing toxins, the exact nature of which is imperfectly understood. These toxins are formed under suitable conditions, usually by *staphylococci,* occasionally by *streptococci,* and rarely by *coliform* and proteus groups.

Food infection usually is caused by a specific group of organisms, namely the salmonella group, but occasionally by the dysentery group.

GENERAL SYMPTOMS—Gastrointestinal distress, nausea, vomiting, diarrhea, urticaria, and circulatory and nervous disturbances are the general symptoms of food poisoning, and they may vary from mild discomfort to violent disturbances of the normal functions of the body. In more acute forms, the neurologic symptoms may overshadow the gastrointestinal symptoms, followed by collapse. Death is usually due to respiratory paralysis, cardiac failure, or secondary pneumonia.

TREATMENT OF POISONING

Poison Control Centers

The United States Public Health Service has established a clearing house for poison information. Its chief purpose is to interchange information with the many local poison control centers established throughout the country. These centers have been established at major medical centers and operate on a 24 hour a day basis. Every medical facility should make an attempt to utilize the services of the poison control center contiguous to its activity.

Basic Procedures

1. To get the bulk of the poison out of the stomach quickly. Removal of the poison from the stomach may be accomplished by the use of emetics (agents used to promote vomiting) and by washing out the stomach through use of a stomach tube (when not contraindicated)

2. To administer an antidote for the remainder of the poison left in the stomach

3. To eliminate from the system that portion of the poison which has been absorbed

4. To treat the symptoms as they arise

5. To take possession of all foods, medicines, vomited matter, feces, urine, and anything that may be of value in determinig the identity of the poison and whether taken accidentally or intentionally, or whether criminally administered

Cases of poisoning are frequently encountered where the services of a physician or poison control center are unavailable. In these cases, it often happens that it is impossible to obtain much or any information relative to the nature or type of poison taken. Since any delay in treatment may result in serious consequences, every hospital corpsman should possess some practical knowledge of how to manage a poisoning case when the nature of the poison is unknown.

For the purpose of general treatment in unknown poisons, the case may be considered as one of two kinds. It may either be a case where the local effects of the poison have injured the mucous lining of the mouth, esophagus, and stomach to an extent contraindicating the use of intruments or emetics for evacuating the stomach; or it may be a case where the poison has had little or no effect on the mucous lining of the alimentary tract, and therefore one in which it would be safe to use a stomach tube or an emetic.

Poisons coming under the classification of corrosives generally produce conditions such as mentioned in the first instance. They have a more or less injurious and even destructive effect on the lining of the mouth and stomach. Naturally in such cases the introduction of any sort of instrument, even a soft rubber stomach tube, may result in a perforation in the weakened wall. In such conditions, rupture of the stomach may even be caused by emesis. Poisons classified as irritants and neurotics have, generally, no special local or injurious action on the mucous membrane of the mouth and the stomach and, therefore, in such cases the stomach may be evacuated and washed with the aid of a stomach tube; or, in the absence of a stomach tube, emetics may be resorted to without fear of injury.

Even when the exact nature of the poison is unknown, one seldom finds it difficult to determine whether the offensive material is corrosive or not; a corrosive leaves unmistakable signs about the lips and mouth. When the local condition points to a corrosive poison, the evidence usually indicates also whether it is of the acid or alkali type. In the case of an acid, the general treatment is the same as that outlined under Acids in this chapter, while the general treatment for almost any strong alkali is outlined under Alkalies. In neither case is the stomach tube or an emetic employed.

In cases where there are no signs of injury to the lining of the mouth, the probabilities are that the poison is one of the irritants or neurotoxins; that is, the poison may be a salt of one of the poisonous metals, such as arsenic, mercury, copper, tin, zinc, or silver. It may be one of the crude drugs such as opium, belladonna, or nux vomica; or perhaps one of their many alkaloids, the most common of which are the alkaloids morphine, codeine, cocaine, heroin, atropine, and strychnine. In an unknown case, it would hardly be strychnine, however, for the symptoms in a case of strychnine poisoning are very characteristic. The patient may be suffering from poisoning by one of the drugs known as glycosides, of which the active principles of digitalis are examples; or the case may be one of poisoning by grain alcohol, wood alcohol, chloral hydrate, a cyanide, phosphorus, iodine (leaves stains on lips), phenol (the undiluted form has corrosive action), or the barbituric acid derivatives.

EMETICS

There are a number of drugs which produce nausea and vomiting as reactions from overdosage, but the number that may be used intentionally to cause the patient to vomit is relatively small. Vomiting may be stimulated by gagging or stroking the throat with the finger or a tongue depressor when the stomach is full of liquid. When an emetic is required, the following may be considered:

1. One to three teaspoons of powdered mustard in a glass of warm water

2. Warm, soapy water (also has antidotal action for a number of metallic salts, principally mercuric chloride)

3. Warm, salty (2 teaspoonsful of table salt) water

4. Ipecac Syrup, 15-30 ml

REGULATIONS AND RESPONSIBILITIES PERTAINING TO CONTROLLED SUBSTANCES, ALCOHOL, ALCOHOLIC BEVERAGES, AND DANGEROUS DRUGS

Hospital corpsmen handling controlled substances and other drugs are held responsible for their proper distribution and custody; nowhere is the demand for strict integrity more important. Misuse, abuse, loss, and theft of these substances has always, sooner or later, ended in tragedy and severe consequences. No one has ever profited by their misappropriation.

It behooves every hospital corpsman to thoroughly understand the responsibility concerning the custody and handling of controlled substances and other drugs and to be familiar with the regulations and laws pertaining to them.

RESPONSIBILITY

Although the *Manual of the Medical Department,* Chapter 21, specifically assigns custodial responsibility for controlled substances, alcohol, alcohol beverages, and dangerous drugs to a commissioned officer and more specific control to the Nursing Service, you, as a hospital corpsman are held responsible for:

1. All controlled substances and other drugs entrusted to you.

2. Their proper administration: the right drug in the right dose at the right time to the right patient in the right way.

3. Their proper security. All controlled substances and other drugs are to be kept under lock and key. Neither keys nor drugs are ever entrusted to a patient.

ACCOUNTABILITY

Hospital corps personnel are held accountable for all quantities of drugs entrusted to them. Great care should be exercised to prevent the loss or unauthorized use of drugs. No drug will be administered without proper authority. In addition, *U.S. Navy Regulations* distinctly forbids the introduction, possession, use, sale, or other transfer of marijuana, narcotic substances, or other controlled substances.

DRUG DEFINITIONS

Although all drugs are to be treated with utmost respect, certain groups require special handling and security measures.

Controlled Substances are those drugs listed in the Comprehensive Drug Abuse Prevention and Control Act of 1970, alcohol, and alcoholic beverages. Schedules of controlled substances are established by Section 202, Part 208 of the Act. Products may migrate between schedules and new products may be added. These changes will be promulgated by the Navy Materiel Support Command in the Medical/Dental Materiel Bulletin.

Controlled Drugs are all controlled substances, plus any additional drug products designated for control by an appropriate military authority at the command level or in higher echelons of the chain of command.

Accountable Controlled Substances and Drugs are all items listed on schedules I and II and only those items on schedules III, IV, and V or other legend drugs that appropriate authority at command level or higher echelons in chain of command deem necessary for accountable procedures. By regulation and policy accountable controlled substances and accountable controlled drugs require daily usage and monthly inventory reconciliation.

DANGEROUS DRUGS—Poisonous drugs, chemicals, and similar substances are classified as dangerous drugs. Drugs of a powerful nature which may be mistaken for other drugs because of their appearance will be kept in containers of distinctive color, size, or shape and in a special section wherever drugs are stored. In addition, the following specific safe-guards will be enforced:

1. All dangerous poisons are to be indicated by appropriate poison labels.
2. Caustic acids such as glacial acetic, sulfuric, nitric, concentrated hydrochloric, or oxalic acids will be stored in appropriate containers and not issued to wards or outpatients.
3. Methyl alcohol (for use by Medical activities) will be accounted for and issued by the supply division in the same manner as other controlled substances. Methyl alcohol will not be stored, used, or dispensed by the pharmacy, ward, or outpatient treatment facility.

MANUAL OF THE MEDICAL DEPARTMENT, U.S. NAVY

For all intents and purposes, Chapter 21, *Manual of the Medical Department, U.S. Navy,* directs precise measures to be taken to insure the proper control and custody of controlled substances, controlled drugs, and accountable controlled substances and drugs. The Comprehensive Drug Abuse Prevention and Control Act of 1970, as previously mentioned, establishes five schedules dependent upon a drug's potential for abuse, medical usefulness, and degree of dependency, if abused. The following schedules are provided:

1. Schedule I substances—Maximum abuse potential and no current accepted medical usefulness (i.e., Heroin, Marijuana, LSD, Peyote).

2. Schedule II substances—High potential for abuse and accepted medical usefulness; abuse leads to severe psychological or physical dependence (i.e., Morphine, Pentobarbital, Meperidine, Amphetamines).

3. Schedule III substances—Lesser degree of abuse potential with accepted medical usefulness; abuse leads to moderate dependence (i.e., paregoric, Noludar, most barbiturates, Empirin #3). Prescriptions of these substances can be refilled up to 5 times within 6 months.

4. Schedule IV substances—Low abuse potential with accepted medical usefulness; limited dependence problems (i.e., Valium, Chloral hydrate, meprobamate, phenobarbital).

5. Schedule V substances—Low abuse potential, accepted medical usefulness, and limited dependence factors (i.e., Lomotil, ETH with Codeine, antitussin with Codeine). Prescriptions may be refilled at the discretion of the prescriber.

ANTIDOTES AND ANTIDOTE LOCKERS

All persons in the Medical Department will be duly aware regarding the danger of poisons and use of antidotes. A separate poison antidote locker marked "ANTIDOTE LOCKER" will be located prominently in every emergency treatment room. If necessary, more than one locker may be used. In small ships that have only one independent duty hospital corpsman aboard, the locker should be located immediately outside the emergency treatment room for ready accessibility when the corpsman is absent. The locker will be secured with a seal. Whenever the seal is broken, the contents will be inventoried, the used antidotes replaced, and the locker resealed. An inventory list for each shelf will be placed on the inside of the door together with a copy of NAVMED P5095, Poisons, Overdoses, and Antidotes, and the address and telephone number of the local poison control center.

The following minimum antidotes listed in NAVMED P-5095 and only the supplies and instruments required for treatment of poisoning or overdoses will be kept in the locker. All personnel involved in emergency room treatments will be thoroughly familar with the contents of the locker and their use. The books, *Clinical Toxicology of Commercial Products,* by Gleason, Gosselin, Hodge, and Smith and *Handbook of Poisons* by Robert H. Driesback, M.D. are recommended as reference material and should be outside the locker for easy reference. The list may be modified to meet local requirements; however, it is very important that each item be kept up to date to avoid depletion or spoilage.

For further information, consult Chapter 21, *Manual of the Medical Department, U.S. Navy.*

Antidote Locker Located in Sick-Bay

AMYL NITRITE PEARLS, 5's	1PG
CAFFEINE AND SODIUM BENZOATE AMPULES, 12's	1/2 PG
CALCIUM GLUCOHEPTONATE AMPULES 5 cc, 25's	1/5 PG
2-PAM CHLORIDE	1 BT
BAL IN OIL (10%) DIMERCAPROL INJ., 10's	1 PG
SODIUM CHLORIDE INJ., 250cc	1 EA
AROMATIC SPIRITS OF AMMONIA, 4 OZ	1 BT
POTASSIUM PERMANGANATE SOLUTION 1:5000, 50 cc	1 EA
STERILE SYRINGES, 2cc, 5cc, 10cc	1 EA
STERILE NEEDLES, 26ga, 25ga, 23ga, 21ga	1 EA
STOMACH LAVAGE TUBE IN CLEAN WRAPPER (UNSTERILE)	1 EA
SYRINGE, GLASS, BULB, IRRIGATING, 4 OZ	1 EA
SYRINGE, CARTRIDGE, EPINEPHERINE INJ., 1:1000	1 EA

Antidote Locker Located in Passageway

TABLE SALT, 1/2 LB
VEGETABLE OIL, 4 OZ
CASTOR OIL, 4 OZ
PREPARED CHALK, 1/4 LB
CONSTARCH, 1/4 LB
SYRUP OF IPECAC, 4 OZ
MILK OF MAGNESIA, 8 OZ
WATER TUMBLER, 1 EA
AIRWAY (WITH APPROPRIATE INST) 1 EA
MEASURING CUP 1 EA
TABLESPOON 1 EA

DRY MUSTARD, 2 OZ
EPSOM SALT, 1/4 LB
MINERAL OIL, 4 OZ
SODIUM BICARBONATE, 1/4 LB
POWDERED MILK AND EGGS, 1 CN
ACTIVATED CHARCOAL, 1/2 LB
VINEGAR, 4 OZ
EYEWASH SOLUTION, 8 OZ
CAN OPENER 1 EA
EYECUP 1 EA
TEASPOON 1 EA

CHAPTER 8

PHARMACY

With advancement come greater responsibilities and more specialized assignments. As you progress to Hospital Corpsman Third Class and eventually Second Class, you will be assigned duties in specialized departments throughout the hospital and especially aboard ship. Not only will your responsibilities increase, but your training will become more and more diversified.

One of the departments to which you may be assigned is the pharmacy, where you will assist in compounding, preparing, and dispensing medicines. This chapter will give you a basic introduction to the field of pharmacy and prepare you for the requirements of your next rate.

INTRODUCTION

Pharmacy may be defined as the art and science of identifying, collecting, standardizing, compounding, and dispensing medicinal substances of various kinds and combinations used in preventive and curative medicine.

Pharmacy is symbolized by the superscription, Rx, now generally understood to represent a contraction of the Latin imperative recipio, meaning "take thou."

PUBLICATIONS OF PHARMACY

There are several books that are considered "bibles" of pharmacy, which contain standardized reference material used throughout the profession. You should become familiar with them and at the earliest opportunity browse through a copy to get an idea of their contents.

There is one book with official (legal) status that is a constant source of reference for pharmacists: the *United States Pharmacopeia* (USP). It is endowed with legal status by the U.S. Government and its contents have been upheld in courts of law, up to and including the U.S. Supreme Court.

It provides regulatory agencies with enforceable standards of purity, quality, and strength for drugs generally accepted by the medical profession. Manufacturers or pharmacists who label their product as "USP" must conform to the standards of preparation set forth therein.

The USP first appeared in 1820 and is now revised every five years by the U.S. Pharmacopeia Convention. The drugs and preparations listed and described in the USP are only those which have stood the test of research and continued use, leaving absolutely no doubt as to their efficacy and acceptance by the medical professions.

The United States Dispensatory (USD) contains complete and additional information on all drugs in the USP and on many unofficial drugs of note as well. Of necessity then, it is also revised every five years. It is called the encyclopedia of medications.

Remington's Pharmaceutical Sciences is an excellent source book for compounding information. It is a basic text of pharmaceutical science.

METROLOGY

Metrology, called the arithmetic of pharmacy, is the science of weights and measures and its application to drugs and their dosage, preparation, compounding, and dispensing.

It is absolutely vital for hospital corpsmen to thoroughly understand the principles and applications of metrology in pharmacy. Without a thorough knowledge of this field, one cannot function adequately in compounding and dispensing drugs. Errors in this area endanger the health, even life of the patient, and lead to embarrassment and tragedy.

THE METRIC SYSTEM

This is the official system of weights and measures used in the Navy and is rapidly becoming the universally accepted system through the modern world. As hospital corpsmen, we will concern ourselves primarily with the divisions of weight, volume, and linear measurement of the metric system. Each of these divisions has a primary or basic unit.

The basic unit of weight in the metric system is the gram. NOTE: The abbreviation for gram is "g."

The basic unit of volume in the metric system is the liter, abbreviated "l."

The basic linear unit of the metric system is the meter, abbreviated "m."

By using the prefixes deka, hecto, and kilo for multiples of ten, one hundred, and one thousand basic units, and the prefixes micro, milli, centi, and deci for one/ten thousandth, one/thousandth, one/hundreth, and one/tenth, you have the basic structure of the metric system. By applying the appropriate basic unit to the scale of figure 8-1, you can readily determine its proper terms. For instance, using the gram as the basic unit of weight, we can readily see that ten grams would be 1 dekagram, 100 grams would equal 1 hectogram and 1000 grams are called a kilogram. Conversely, going down the scale, 0.1 gram is then called a decigram, 0.01 gram a centigram and 0.001 gram is called a milligram. NOTE: In the metric system, no units or their abbreviations are capitalized.

THE APOTHECARY SYSTEM

Although fast becoming obsolete, the Apothecary system is still used and must be taken into consideration. It has two divisions of measurement: weight and volume. The basic unit of weight is the grain, abbreviated gr., and never capitalized, and the basic unit of volume is the minim.

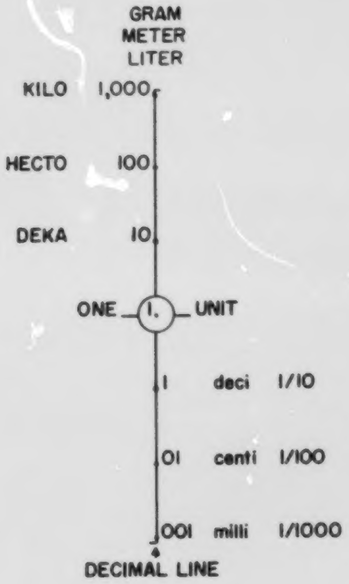


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Figure 8-1.—Metric System.

THE AVOIRDUPOIS SYSTEM

This system is the one used in the United States for weight only and is used in commercial buying and selling. The pound as we know it when going to market is the sixteen ounce pound of the Avoirdupois system. The basic unit of the Avoirdupois system is also the grain.

TABLES OF WEIGHTS AND MEASURES

Table 8-1 is a table of weights and measures; it should be thoroughly studied and memorized.

CONVERTING WEIGHTS AND MEASURES

Occasionally there are times when it will be necessary to convert weights and measures from

Table 8-1.—Measuring Equivalents

Systems of Weights	Systems of Volume Measures	Linear Measure
AVOIRDUPOIS		
Primary unit of weight is the grain.		
437.5 grains = 1 ounce (av. oz.)		
16.0 ounces = 1 pound (av. lb.)		
APOTHECARY	**APOTHECARY**	
Primary unit of weight is the grain.	Smallest unit of volume is the minim.	
20 grains (gr) = 1 scruple (℈)	60 minims (m) = 1 fluid dram (ʒ)	
3 scruples = 1 dram (ʒ)	8 fluid drams = 1 fluid ounce (℥)	
8 drams (480 gr) = 1 ounce (℥)	16 fluid ounces = 1 pint (0)	
12 ounces = 1 pound (lb)	2 pints = 1 quart (qt.)	
	4 quarts = 1 gallon (Cong. or gal.)	
METRIC	**METRIC**	**METRIC**
Primary unit of weight is the gram.	Primary unit of volume is the liter.	Primary unit of linear measure is the meter.
1000.000 grams = 1 kilogram (kg)	1000.000 liters = 1 kiloliter (kl)	1000.000 meters = 1 kilometer (km)
100.000 grams = 1 hectogram (hg)	100.000 liters = 1 hectoliter (hl)	100.000 meters = 1 hectometer (hm)
10.000 grams = 1 dekagram (dkg)	10.000 liters = 1 dekaliter (dkl)	10.000 meters = 1 dekameter (dkm)
1.000 gram = 1 gram (gm)	1.000 liter = 1 liter (l)	1.000 meter = 1 meter (m)
0.1 gram = 1 decigram (dg)	0.1 liter = 1 deciliter (dl)	0.1 meter = 1 decimeter (dm)
0.01 gram = 1 centigram (cg)	0.01 liter = 1 centiliter (cl)	0.01 meter = 1 centimeter (cm)
0.001 gram = 1 milligram (mg)	0.001 liter = 1 milliliter (ml)	0.001 meter = 1 millimeter (mm)

NOTE: The relationship of the basic units in the Metric System should be noted. The meter, which is 1/40,000,000 of the earth's polar circumference, is the natural standard. The volume contained in 1/10 of a meter cubed is 1 liter. The weight of 1 cubic centimeter of distilled water is 1 gram. Grams of water are approximately equivalent at all temperature ranges. Current usage prefers that ml rather than cc be used since it has been found that 1000 cc do not equal exactly 1 liter.

one system to another, either metric to Apothecary or vice versa. Since patients can hardly be expected to be familiar with either system, the dosage directions on the prescription must always be translated into a household equivalent which they understand. Therefore, the household measurements are standardized, assuming that the utensils are common enough to be found in any home. Table 8-2 is a table of household measures, with their metric and Apothecary equivalents.

Table 8-2.—Table of Metric Doses with Approximate Equivalents. CAUTION: For the conversion of specific quantities in a prescription or in converting a pharmaceutical formula from one system to another, exact equivalents must be used.

Metric	Apothecary	Household
5 ml	1 fl. dr.	1 teaspoonful*
10 ml	2 fl. dr.	1 dessertspoonful
15 ml	4 fl. dr. (½ fl.oz.)	1 tablespoonful
30 ml	8 fl. dr. (1 fl. oz.)	2 tablespoonfuls
60 ml	2 fl. oz.	1 wineglassful
120 ml	4 fl. oz.	1 teacupful
240 ml	8 fl. oz.	1 tumblerful
480 ml	16 fl. oz.	1 pint
960 ml	32 fl. oz.	1 quart

*Official U.S.P. teaspoonful is 5 ml.

CONVERSION

It is often necessary in the practice of pharmacy to convert from one system to another in order to dispense the substances which have been ordered in their proper amounts. Although the denominations of the metric system are not commensurate with those of the common systems, the Bureau of International Standards has established conversion standards which will satisfy the degree of accuracy required in almost any practical situation. Ordinary pharmaceutical procedures generally require something between two and three figure accuracy, and the following tables of conversion are more than sufficient for practical use. Naturally, if potent agents are involved, a more precise conversion factor must be utilized for purposes of calculation.

Conversion Table for Weights and Liquid Measures

1 grain = 0.065 gram or 65 milligrams
1 gram = 15.432 grains
1 milliliter = 16.23 minims
1 fluid ounce = 29.57 milliliters

To Convert From:

1. grains to grams. $\frac{\text{grains}}{15.432} = \text{grams}$
2. ml to fl. oz. $\frac{\text{ml}}{29.57} = \text{fl. oz.}$
3. minims to ml $\frac{\text{minims}}{16.23} = \text{ml}$
4. milligrams to grains $\frac{\text{milligrams}}{65} = \text{grains}$
5. grams to grains grams x 15.432 = grains
6. fl. oz. to ml. fl. oz. x 29.57 = ml
7. ml to minims ml x 16.23 = minims
8. grains to milligrams grains x 65 = milligrams

REDUCING AND ENLARGING FORMULAS AND DOSES

Reducing Formulas

In compounding, it is often necessary to reduce or enlarge the original recipe or formula. Most of the formulas in the USP are given in quantities of 100 or 1000 grams of weight or milliliters of volume total.

There are many ways of reducing and enlarging formulas. The methods most commonly used are:

1. Ratio and proportion.

Example: Reduce the following formula for potassium arsenite solution to make 120 ml.

Arsenic trioxide	10 g
Potassium bicarbonate	7.6 g
Alcohol	30 ml
Distilled water, a sufficient quantity to make	1000 ml

By using ratio and proportion, the amount of arsenic trioxide to be used:

$1000 : 120 :: 10 : X$
$1000\,X = 1200$
$X = 1.2$ grams of arsenic trioxide needed.

For potassium bicarbonate:

$1000 : 120 :: 7.6 : X$
$1000\,X = 912$
$X = 0.912$ grams of potassium bicarbonate needed.

For the alcohol:

$1000 : 120 :: 30 : X$
$1000\,X = 3600$
$X = 3.6$ ml of alcohol needed.

The new formula is written as follows:

Arsenic trioxide	1.2 g
Potassium bicarbonate	0.912 g
Alcohol	3.6 ml
Distilled water, q.s.	120.0 ml

2. Fractional method.

The numerator will be the amount of the new formula, and the denominator will be the amount of the original formula. Example: Reduce the formula for potassium arsenite solution in the preceding item to make 120 ml.

For the arsenic trioxide:

$$\frac{120}{1000} \times 10 = 1.2 \text{ g}$$

potassium bicarbonate:

$$\frac{120}{1000} \times 7.6 = 0.912 \text{ g}$$

alcohol:

$$\frac{120}{1000} \times 30 = 3.6 \text{ ml}$$

water:

q.s. to 120 ml

Enlarging Formulas

Use the fractional method as above.

Example: Calculate the amounts of ingredients for a gallon of the following liquid:

Glycerin	3 fl. dr.
Liq. phenol	1 fl. dr.
Water qs ad	4 fl. oz.

There are 128 fluid ounces in a gallon. The fraction would then become $\frac{128}{4}$ or 32. Multiply each ingredient by 32.

2 fl. dr. x 32 = 96 fl. dr. or 12 fl. oz. of glycerin.

1 fl. dr. x 32 = 32 fl. dr. or 4 fl. oz. of liq. phenol.

Then add sufficient quantity of water to make the total volume measure 128 fl. oz. (one gallon).

Reducing Doses

Use ratio and proportion.

Example: We have 1/2 grain tablets on hand, and want to give the patient a 1/8 grain dose. Use 24 minims of water as the solvent.

1/2 gr .... 24 minims of solvent

1/8 g .... X minims of solution

$$\frac{1}{2} : \frac{1}{8} :: 24 : X$$

$$\frac{1}{2}X = 3$$

$$X = 6$$

Give the patient 6 minims of the solution.

Enlarging Doses

Use ratio and proportion.

Example: A tablet contains 1/2 grain of phenobarbital, and we wish to give the patient 3/4 grain.

Dissolve two (2) tablets in 4 ml of water:

1 grain .... 4 ml of solvent

3/4 grain .... X ml of solution

1 : 3/4 :: 4 : X   X = 3

Give the patient 3 ml of the solution

MATHEMATICS

A review of basic mathematics will help you understand the important phases of pharmaceutical calculations.

DECIMALS

The decimal point represents a power of ten. Everytime the decimal is moved one digit to the right, the number is multiplied by ten and conversely, every time it is moved one digit to the left, the number is divided by ten.

Example:

3.0—if we move the decimal one digit to the right: 30.0, we have multiplied the number 3 x 10 = 30. If we move it another digit to the right, we have again multiplied by ten: 30.0 x 10 = 300.00.

3.0—moving the decimal one digit to the left, we will have divided the number 3 by ten: 3 ÷ 10 = 0.3.

If we move the decimal another digit to the left, we will have divided by ten again: 0.3 ÷ 10 = 0.03, and so forth.

The number, or numbers, left of the decimal point are whole numbers or units; the numbers to the right of the decimal point are fractional parts of the same unit. If you compare the decimal with our monetary system this is readily understood.

Example:

$$3.85 \text{ grams} = \begin{cases} 3 \text{ grams} \\ 8 \text{ decigrams} \\ 5 \text{ centrigrams} \end{cases} \qquad 3.85 \text{ dollars} = \begin{cases} 3 \text{ dollars} \\ 8 \text{ dimes} \\ 5 \text{ cents} \end{cases}$$

Addition of Decimals

When adding, keep the decimal points in a vertical line to avoid confusing fractional numbers with whole numbers.

Examples:

$$\begin{array}{r} 1.30 \\ .50 \\ 11.2 \\ \underline{.015} \\ 13.015 \end{array} \qquad \begin{array}{r} .065 \\ 1.435 \\ 23.015 \\ \underline{456.65} \\ 481.165 \end{array}$$

Subtraction of Decimals

Keep the decimal points in a vertical line.

Examples:

$$\begin{array}{r} 30.5 \\ \underline{-15.432} \\ 15.068 \end{array} \qquad \begin{array}{r} 16.23 \\ \underline{-4.29} \\ 11.94 \end{array}$$

Multiplication of Decimals

The number of places to point off from the right in the product is found by adding the number of places in the multiplicand and multiplier.

Example:

$$\begin{array}{r} 2.5 \\ \underline{x\ 5} \\ 12.5 \end{array}\ \underline{\text{1 place}} \qquad \begin{array}{r} 5.5 \\ \underline{x\ 2.2} \\ 110 \\ \underline{110\ } \\ 12.10 \end{array}\ \underline{\text{2 places}} \qquad \begin{array}{r} 5.11 \\ \underline{x\ 2.5} \\ 2555 \\ \underline{1022\ } \\ 12.775 \end{array}\ \underline{\text{3 places}}$$

Division of Decimals

Division means to determine how many divisors are equivalent to the dividend.

DIVIDEND ÷ DIVISOR = QUOTIENT
or

$$\begin{array}{r} \text{QUOTIENT} \\ \text{DIVISOR}\ \overline{)\text{DIVIDEND}} \end{array}$$

Make the divisor a whole number by moving the decimal point to the right of the last figure.

Move the decimal point in the dividend as many digits to the right as it was moved in the divisor.

Place the decimal point in the quotient (answer) directly above the new position of the decimal in the dividend.

Example:

Divide 510 by 25.5

1st step, $25.5\overline{)510.}$

2nd step, $255.\overline{)5100.}$

3rd step, $$\begin{array}{r} 20. \\ 255.\overline{)5100.} \\ \underline{510} \\ 0 \end{array}$$

Therefore 510 = 20 x 25.5

Helpful Hints When Mulitplying or Dividing by Decimals

To multiply by ten move the decimal point one place to the right. To multiply by 100 move the decimal point two places to the right. In other words, move the decimal point to the right to coincide with the number of zeroes in the multiplier when it is stated in "tens."

Division by powers of ten require moving the decimal point to the left by one place for each zero which appears in the divisor.

Changing a Decimal to a Common Fraction

Write the denominator in the power of ten and reduce to lowest terms.

Examples:

0.8 would be $\frac{8}{10}$ reduced to $\frac{4}{5}$

0.04 would be $\frac{4}{100}$ reduced to $\frac{1}{25}$

FRACTIONS

A fraction is an expressed PART of a unit. The parts of a fraction are:

NUMERATOR—The first or upper part of a fraction which indicates the number of the equal parts of a unit concerned.

DENOMINATOR—indicates the number of parts into which a unit is divided and constitutes the second or lower part of a fraction.

Types of Fractions

Proper fraction—a fraction whose numerator is less than the denominator.

Examples:

$\frac{1}{2}, \frac{6}{11}, \frac{22}{75}, \frac{41}{111}$

Improper fraction—a fraction whose numerator is equal to or greater than the denominator.

Examples:

$\frac{3}{3}, \frac{15}{10}, \frac{45}{30}, \frac{101}{9}$

Mixed Numbers—a whole number combined with a fraction.

Examples:

$1\frac{1}{2},\ 2\frac{3}{5},\ 55\frac{7}{10}$

To Change A Mixed Number to an Improper Fraction

Multiply the whole number by the denominator of the fraction and add the numerator to this product; write this sum over the denominator.

Example:

$5\frac{6}{7} (7 \times 5 = 35) + 6 = \frac{41}{7}$

Addition of Fractions

In order to add fractions, a common denominator must be determined (a number which is evenly divisible by each of the denominators concerned).

Example:

$$\frac{1}{2} + \frac{1}{3} + \frac{5}{6} = ?$$

1. Multiply the denominators by each other. This gives you a common denominator.

$$2 \times 3 \times 6 = 36$$

2. Divide each original denominator into this common denominator and multiply the quotient by the old numerator. This gives you new numerators.

$$\frac{18}{36} + \frac{12}{36} + \frac{30}{36}$$

3. Reduce each fraction to lowest terms

$$\frac{18}{36} + \frac{12}{36} + \frac{30}{36} = \frac{3}{6} + \frac{2}{6} + \frac{5}{6}$$

4. Add the numerators only, place the sum over the common denominator, and reduce to lowest terms.

$$\frac{3}{6} + \frac{2}{6} + \frac{5}{6} = \frac{10}{6} = 1\frac{4}{6} = 1\frac{2}{3}$$

Therefore, $\frac{1}{2} + \frac{1}{3} + \frac{5}{6} = 1\frac{2}{3}$

Subtraction of Fractions

1. Establish a common denominator.
2. Divide each original denominator into this common denominator and multiply the quotient by the old numerator.
3. Subtract one numerator from the other and reduce to lowest terms.

Example:

$$\frac{9}{11} - \frac{3}{4} = \frac{36 - 33}{44} = \frac{3}{44}$$

Multiplication of Fractions

1. Multiply the numerators to determine a new numerator.

2. Multiply the denominators to determine a new denominator.

3. Write the new numerator over the new denominator and reduce to lowest terms.

Examples:

a. $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$ b. $\frac{2}{3} \times \frac{3}{5} = \frac{6}{15}$ or $\frac{2}{5}$

NOTE: If you have a mixed number to multiply, change to an improper fraction and proceed as above.

Example:

$$2\frac{1}{2} \times 1\frac{1}{4} = \frac{5}{2} \times \frac{5}{4} = \frac{25}{8} = 3\frac{1}{8}$$

Division of Fractions

1. Invert the divisor.

2. Change the division sign to a multiplication sign and proceed as in multiplication.

3. Reduce to lowest terms.

Example:

$$\frac{1}{4} \div \frac{3}{4} = \frac{1}{4} \times \frac{4}{3} = \frac{4}{12} \text{ or } \frac{1}{3}$$

$$\frac{1}{9} \div \frac{1}{6} = \frac{1}{9} \times \frac{6}{1} = \frac{6}{9} \text{ or } \frac{2}{3}$$

NOTE: If mixed numbers are involved, change to improper fractions and proceed as above.

Examples:

$$1\frac{1}{4} \div 1\frac{1}{5} = \frac{5}{4} \div \frac{6}{5} = \frac{5}{4} \times \frac{5}{6} = \frac{25}{24} \text{ or } 1\frac{1}{24}$$

$$1\frac{3}{8} \div \frac{2}{5} = \frac{11}{8} \div \frac{2}{5} = \frac{11}{8} \times \frac{5}{2} = \frac{55}{16} \text{ or } 3\frac{7}{16}$$

To Change a Fraction to a Decimal

Divide the numerator by the denominator. Some of the results can be stated in their exact equivalents such as 1/2, 1/4, or 2/5; others will not divide evenly and will be expressed as close approximates.

Examples:

$$\frac{1}{4} \quad \begin{array}{r} .25 \\ 4\overline{)1.00} \\ \underline{8} \\ 20 \\ \underline{20} \end{array} \qquad \frac{1}{7} \quad \begin{array}{r} .14 \\ 7\overline{)1.00} \\ \underline{7} \\ 30 \\ \underline{28} \end{array}$$

PERCENTAGE

Percentage (%) means "parts per hundred" or the expression of fractions with denominators of 100. Thus a 10 percent solution may be expressed as 10%, $\frac{10}{100}$, 0.10, or 10 parts per 100 parts.

It is often necessary for the pharmacist to compound solutions of a desired percentage strength. Percentage in that respect means parts of active ingredient per 100 parts of total preparation.

The three basic rules to remember in solving percentage problems are:

1. To find the amount of the active ingredient when the percentage strength and the total quantity ARE known, multiply the total weight or volume by the percent (expressed as a decimal fraction).

Example: Substance X contains 38% fat. How many grams of fat are required to prepare 120 grams of Substance X?

Solution: 38% is expressed as a decimal fraction 0.38 and multiplied by the amount of the finished product required.

$$\begin{array}{r} 120 \text{ grams} \\ \underline{.38}\phantom{\text{ grams}} \\ 960\phantom{\text{ grams}} \\ \underline{360}\phantom{\text{ grams}} \\ 45.60 \text{ grams—the weight of fat needed.} \end{array}$$

2. To find the total quantity of a mixture when the percentage strength and the amount of the active ingredient are known, divide the weight or volume of the active ingredient by the percent (expressed as a decimal fraction).

Example: If a mixture contains 20% of substance Y, how many grams of the 20% mixture would contain 8 grams of Y?

Solution: 20% is expressed as a decimal fraction 0.20. Divide the weight (8 grams) by the percent, thus:

$$\begin{array}{r} 40.0 \text{ grams,} \\ .20\overline{)8.00}\phantom{\text{ grams,}} \\ \underline{8\,0}\phantom{\text{ grams,}} \\ 00\phantom{\text{ grams,}} \end{array}$$

the weight of 20% mixture which would contain 8 grams of substance Y.

3. To find the percentage strength when the amount of the active ingredient and the total quantity of the mixture are known, divide the weight or volume of the active ingredient by the total weight or volume of the mixture; multiply the resulting answer by 100 to convert the decimal fraction to percent.

Example: Find the percentage strength of Z if 300 grams of a mixture contains 90 grams of substance Z.

Solution:

$$\begin{array}{r} 0.3 \\ 300\overline{)90.00} \\ \underline{90\,0} \\ 0 \end{array}$$

0.3 is the percent of Z expressed as a decimal fraction.

0.3 x 100 (%) = 30% of Z in the mixture.

Alternate Methods for Solving Percentage Problems

Alternate method for solving percentage problems incorporates the three rules discussed above into one equation. This method is often preferred since it eliminates errors which may result from misinterpreting the facts given in the problem.

1. Percent strength =

$$\frac{\text{Amount of active ingredient}}{\text{Total amount of preparation}} \times 100\ (\%)$$

Examples:

a. Calculate the percent of A in a solution if 120 grams of solution contains 6 grams of A.

Solution: Substitute the known facts in the equation and use X for percent (the unknown factor).

$$X = \frac{6}{120} \times 100\ (\%) = 5\ (\%)$$

Therefore X = 5 which is the percent strength of the solution.

b. Calculate the amount of active ingredient in 300 grams of a 5% mixture of active ingredient B.

Solution: Convert 5% to a decimal fraction 0.05. Substitute the known facts in the equations and use X for the amount of active ingredient (unknown).

$$.05 = \frac{X}{300} \qquad X = 15\ g$$

2. A variation of equation 1 uses "parts per hundred" instead of percent with X used as the unknown.

$$\frac{\text{Amount of active ingredient}}{\text{Amount of total preparation}} =$$

$$\frac{\text{Parts of active ingredient}}{\text{100 parts (total mixture)}}$$

Example:

Ascertain the percent of B in a mixture of 600 grams which contains 15 grams of B.

Solution

$$\frac{15}{600} = \frac{X}{100}$$

cross multiply

$$\frac{15 \times 100}{600} = X \text{ or } X = \frac{1500}{600}$$

X = 2.5 The parts of active ingredient per hundred parts of total mixture or 2.5%.

RATIO AND PROPORTION

RATIO is the relationship of one quantity to another quantity of like units. Ratios are indicated as 5:2, 4:1; these would be read as 5 to 2, 4 to 1.

A ratio can exist only between units of the same kind, as the ratio of percent to percent, grams to grams, dollars to dollars; in other words the denominates must be constant.

PROPORTION is two equal ratios considered simultaneously.

Example: 1:3 :: 3:9

Since the ratios are equal the proportion may also be written: 1:3 = 3:9

Terms of Proportion

The first and fourth terms (the terms on the ends) are called the "extremes." The second and third terms (middle terms) are called the "means."

In a proportion the product of the means equals the product of the extremes, therefore, when three terms are known, the fourth or unknown term may be determined.

Application of Proportion

The important factor when working proportions is to put the right values in the right places within the proportion. By following a few basic rules, this can be accomplished without difficulty, and the problem can be solved correctly.

Numbering the four positions of a proportion from left to right, i.e., first, second, third, and fourth, observe the following rules:

1. Let X (the unknown value) always be the fourth position.
2. Let the unit of like value to X be the third position.
3. If X will be smaller than the third position, place the smaller of the two leftover values in the second position; if X will be larger, place the larger of the two values in the second position.
4. Place the last value in the first position.

When the proportion is correctly placed, multiply the extremes and the means and determine the value of X, the unknown quantity.

Example: What is the percent strength of 500 ml of 70% alcohol to which 150 ml of water have been added? When adding 150 ml to 500 ml, the total quantity will be 650 ml, consequently, our four values will be 500 ml, 650 ml, 70% and X, the unknown percent. Using the above rules, the problem will appear as follows: X will be the fourth position. Since X will solve as percent, the unit for like value for the third position will be the 70 of the original solution. When we add water to a solution, the strength is diluted, consequently, the 70 percent strength of this solution will be lessened when we add the extra 150 ml of water, therefore, the smaller of the two figures (650 and 500) will be placed in the second position: 500. 650 remains for the first position. The proportion appears as follows:

$$650 : 500 :: 70 : X$$

Multiplying the extremes and the means we arrive at:

$$650 X = 3{,}500$$

Consequently, by dividing 650 into 3,500 we would arrive at:

$$X = 53.8$$

When 150 ml. of water are added to 500 ml of 70% alcohol, we would then have 650 ml of 53.8% solution.

Example: 1000 ml of 25% solution is evaporated to 400 ml. What is the percent strength?

Letting X be the fourth position, and the unit of like value (25%) the third, we realize that by evaporating the solution it becomes stronger, therefore the LARGER of the other two values (1000) will occupy the second place and 400 will be the first position, thus:

$$400 : 1000 :: 25 : X$$

Multiplying the extremes and the means, we arrive at:

$$400 X = 25{,}000$$

By dividing 400 into 25,000 we get:

$$X = 62.5\%$$

Solution Processes

A great majority of drugs today are dispensed in solution, primarily because they are easier to take in that state, and also because their strength can be more readily controlled.

Although solutions may be either liquid, gaseous, or solid, we will concern ourselves here only with liquid solutions, since they are of primary importance in pharmacy.

A solution is a homogenous mixture of two or more substances, all having completely lost their physical identity. The liquid into which the ingredients are dissolved is called the solvent, and the substances which have been dissolved in it are called the solutes.

NOTE: A solution can consist of many solutes and more than one solvent.

SOLUBILITY—The ability of a solid to dissolve in a given amount of solvent is called its solubility.

Conditions which Influence Solubility:

1. The degree of subdivision of the solute

2. Agitation or stirring

3. Temperature—if a solution contains all of the certain solute that the solvent will hold in solution, the solution is said to be saturated. By raising the temperature of the solution, the solvent will dissolve more of the solute than could have been dissolved under normal conditions. It is then said to be supersaturated.

A good place to find a drug's solubility and solution media is the USP. A very good example of how this is stated is ammonium chloride, USP, which reads:

"One g dissolves in about 3 ml of water, in about 100 ml of alcohol, and in about 8 ml of glycerin. One g dissolves in about 1.4 ml of boiling water."

By the above it can readily be seen that ammonium chloride is very soluble in water, only slightly soluble in alcohol and fairly soluble in glycerin.

Classes of Solutions:

1. True solution—a solution in which the particles of the solute are so small that they pass through both filter paper and animal membrane.

Example: salt in water.

2. Colloidal solution—a solution in which the particles of the solute will pass through filter paper and not through animal membrane.

When preparing solutions in pharmacy, there are three distinct types:

WEIGHT IN WEIGHT (W/W)—This is an expression of concentration in terms of number of grams of active ingredient per 100 grams of total solution.

Example: 2 grams of potassium iodide in 100 grams of solution (total weight) is a 2% (W/W) solution of potassium iodide.

WEIGHT IN VOLUME (W/V)—This is an expression of concentration in terms of numbers of grams of active ingredient per 100 ml of solution.

Example: 85 grams of sucrose in 100 ml of total solution would result in an 85% (W/V) solution of sucrose.

VOLUME IN VOLUME (V/V)—This is an expression of concentration in terms of number of milliliters of active ingredient per 100 ml of solution.

Example: 5 milliliters of clove oil in 100 milliliters of total solution would result in a 5% (V/V) solution of clove oil.

Ratio Solutions

Ratio solutions are usually prepared in strengths as follows: 1:10, 1:150, 1:1000, 1:25000, etc, using even numbers to simplify the calculations. When a solution is made by this method, the first term of the ratio expresses the part of the solute, while the second term expresses the total amount of the finished product.

Rules for solving ratio solution problems:

W/W solution: divide the total weight (grams) of solution desired by the larger number of the ratio, and the quotient will be the number of grams of the solute to be used:

Example: How many grams of $KMNO_4$ are needed to make 500 grams of a 1:2000 solution?

500 ÷ 2000 = 0.25 g of drug needed.

500 - 0.25 = 499.75 g of solvent needed.

W/V solution: divide the total volume in ml of solution desired by the larger number of the ratio and the quotient will be the number of grams of the solute needed.

Example: How many grams of bichloride of mercury are needed to prepare 500 ml of a 1:1000 solution?

500 ÷ 1000 = 0.5 g of drug needed.

Take 0.5 g of the drug and add sufficient (q.s. with) solvent to make 500 ml; this gives you 1:1000 strength.

V/V Solution: divide the total volume in ml of the solution desired by the larger number of the ratio and the quotient will be the number of ml of the drug to be used.

Example: How many ml of HCl would be used to prepare a 1:250 solution with the total volume to be 500 ml?

500 ÷ 250 = 2 ml of HCl needed

Percentage solutions from stock and/or ratio solutions:

Example: From a 1:10 solution of silver nitrate in water, prepare 60 ml of a 1.5% solution of the same ingredients.

A 1:10 (W/V) solution contains 1 gram of solute and enough solvent (q.s.) to total 10 ml solution (finished product). Therefore, one ml of the solution would contain 0.1 gram of the solute. Since it is required that 0.9 gram of the solute be used to prepare 60 ml of the required strength, use 9 ml of the stock solution and enough solvent (water) to make the total volume measure 60 ml.

SPECIFIC GRAVITY

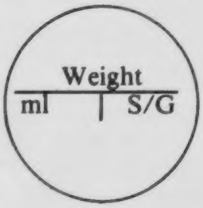
Specific gravity is the ratio of the weight of a given substance to the weight of an equal volume of a substance chosen as a standard. It is a means of determining the strength, purity, or volume of a substance. Water is the chosen substance as the standard for solids and liquids.

It is known that water has a unit weight of 1 gram per ml of space occupied. Basic formulas predicated on this information are:

$$\text{ml} \times \text{S/G} = \text{weight}$$

$$\frac{\text{weight}}{\text{S/G}} = \text{ml}$$

$$\frac{\text{weight}}{\text{ml}} = \text{S/G}$$



Sample problems:

(1) What is the weight in grams of 300 ml of alcohol with a specific gravity of 0.8?

$$\text{ml} \times \text{S/G} = \text{wt.} \qquad 300 \times 0.8 = 240 \text{ grams}$$

(2) 900 grams of glycerin with a S/G 1.25 would measure how many milliliters?

$$\frac{\text{g}}{\text{S/G}} = \text{ml} \qquad \frac{900}{1.25} \qquad \begin{array}{r} 720.\ \text{ml} \\ 125\overline{)90000} \\ \underline{875} \\ 250 \\ \underline{250} \\ 0 \\ \underline{0} \end{array}$$

(3) If 50 ml of a liquid has a weight of 50.5 grams, what is the specify gravity?

$$\frac{\text{wt.}}{\text{ml.}} = \text{S/G} \qquad \frac{50.5}{50} = 1.01 \qquad \text{S/G} = 1.01$$

COMPOUNDING

By definition, compounding implies the various processes and procedures required to manufacture a pharmaceutical preparation for dispensing to the patient. The art of compounding is a profession in itself, and a great deal more training and knowledge is required than can be given here.

It is the intent of this section to familiarize you with the basics of compounding, in order that you may understand and fully appreciate the complexities involved in bringing the correct medication, properly prepared, to the patient.

ETHICS OF COMPOUNDING

Since the patient is of prime importance when compounding medicines, the corpsman must be a person of integrity, skill, and knowledge. Accuracy, both in kind and amount is of utmost importance, as is cleanliness and orderliness, to insure the proper manufacture of medicinal substances.

Pharmaceutical compounding is not an area for short-cuts or substitution, nor is there room for dishonest or haphazard attitudes.

PHARMACEUTICAL PROCESSES

In order to understand the principles of compounding, we must first be familiar with some of the physical processes involved.

Comminution

Comminution is the process of physical reduction of a substance to fine particle size, which makes the substance or drug easier to dissolve and compound.

The processes for comminution are cutting, grating, grinding, pulverizing, trituration, and levigation. The first four terms are self-explanatory and are employed primarily on animal and vegetable drugs from which we wish to extract active principles.

TRITURATION.—This is a process of reducing a solid to a very fine powder by grinding in a mortar and pestle, which will be described in detail later in this chapter.

LEVIGATION.—Solids can be ground to even finer subdivision by adding a small amount of liquid to make a paste and triturating further. This process is ideal for ointments, creams, and lotions.

Processes of separation

An important phase of compounding medicines is that of separating solids from liquids by various means. The main purpose is to purify the liquid, but the process is also employed to obtain certain desirable solids from liquids.

DECANTATION.—Probably the simplest method of separating solids from liquids is the process of decantation, which merely means letting the solids settle to the bottom of the container and pouring off the liquid by gently tilting the container.

COLATION.—When the solids in a liquid are fairly large, a simple method of separation is passing the mixture through a strainer, cheesecloth, or muslin, allowing the fluid to pass through and retaining the solids.

FILTRATION.—This is the process of separating a solid from a liquid with the purpose of obtaining the liquid in a clear transparent state, devoid of impurities. The liquid, called the filtrate, is passed through a porous barrier called the filter. The filtering medium may be of paper, paper pulp, asbestos, cotton, felt, sand, or other suitable material.

In pharmacy we have commercial filter paper readily available for this purpose, and in large installations, mechanical filtering machines filter large quantities in a fraction of the time otherwise required.

CENTRIFUGATION.—Solids are separated from liquids by the centrifugal force of rotation.

PRECIPITATION.—In this method, solids are formed from previously clear solutions by either physical or chemical means and then separated by filtration or other previously mentioned means.

HEAT

Heat is a very important tool in compounding and must be thoroughly understood.

Heat is a form of energy and is measured in degrees. Two common scales of temperature are in use today, Fahrenheit, based on the freezing point of water as 32 degrees and the boiling point as 212 degrees; and Celsius (centigrade) with the freezing point of water 0 degrees and the boiling point 100 degrees. The Celsius scale is now used in almost all temperature determinations, such as scientific work, the weather, et cetera. Unless otherwise specified, all temperatures given in the USP, USD, and Remington's are Celsius.

Thermometers are instruments for measuring the intensities of heat. Most of these instruments are based on the expansion of liquids and vary only in the purpose for which they were intended.

The boiling point of water is 100 degrees Celsius and 212 degrees Fahrenheit. The difference between the boiling point and the freezing point of water is 100 degrees Celsius and 180 degrees Fahrenheit. Therefore, within this span on the thermometers, 1 degree Celsius equals 1.8 degrees Fahrenheit.

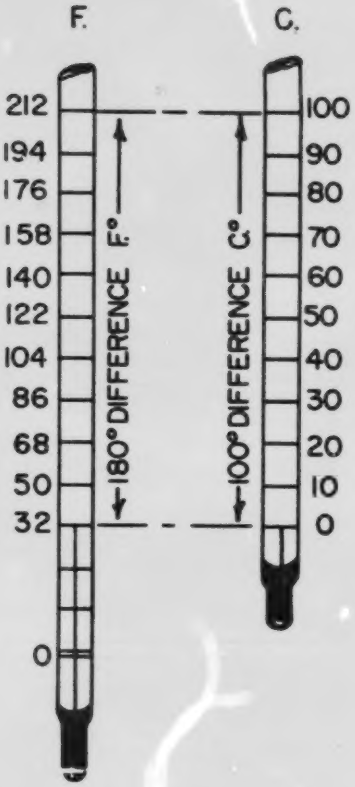
However, temperature readings on either scale are taken in respect to the number of degrees below or above zero, thus 32 degrees must be added to the 180° Fahrenheit in order to obtain the total reading from the Fahrenheit zero point. Substituting these values into the conversion formula (°C. x 1.8) + 32, we have (100° x 1.8) + 32° = 212° Fahrenheit.

If we wish to convert Fahrenheit degrees to centrigrade degrees, the algebraic order of calculation must be reversed and we find that (°F - 32°) ÷ 1.8 = °C. Substituting the values we find (212° - 32°) ÷ 1.8 = 100°C.

To summarize, conversion formulas are as follows:

$$^\circ F. = (^\circ C. \times 1.8) + 32^\circ$$

$$^\circ C. = (^\circ F. - 32^\circ) \div 1.8$$



33.11

Figure 8-2.—Temperature Comparison.

EBULLITION.—This is probably the most common process involving heat. The term merely means boiling, to wit, raising the temperature of a liquid to the point where it changes to vapor or steam. All liquids have a definite temperature at which this occurs, a factor called the boiling point and the basis for separation from other liquids by distillation.

Boiling is used extensively in compounding, since in most cases the solubility of the preparation is increased. As an example, consider making instant coffee with cold water compared to using hot water.

FUSION.—This process is commonly called "melting"—changing a solid to a semisolid or liquid by applying heat. All substances have a definite temperature at which this change occurs, known as the "melting point."

Phamaceutically, fusion is used extensively in making ointments, creams, lotions, and suppositories, since the solid in its liquid state is easier to mix with other ingredients.

Other common processes involving the application of heat are:

DISTILLATION.—Converting a liquid to a vapor by applying heat and condensing the vapor back to a liquid by cooling. The purpose here is purification and separation of liquids.

Extraction

A very important phase of pharmacy is the field of extraction, since a vast number of drugs need to be derived by this process from their raw materials. The drug or substance to be extracted is referred to as the active principle or ingredient. The main physical property involved in extraction is the solubility of the drug. The solvent employed in extraction is called the menstrum. There are two major processes of extraction: percolation and maceration.

PERCOLATION.—By this method, the menstrum is passed through the finely subdivided raw material, from which the active principles are dissolved. A very good example of percolation is coffee-making; the hot water is passed through the finely ground coffee bean, extracting the active principle. A great many drugs, especially those of vegetable and animal origin are obtained in this manner.

MACERATION.—The key word for this process is "soaking." The raw material is soaked in the menstrum for a specified length of time, usually at room temperature, until the soluble principles are softened and dissolved.

PHARMACEUTICAL INSTRUMENTS

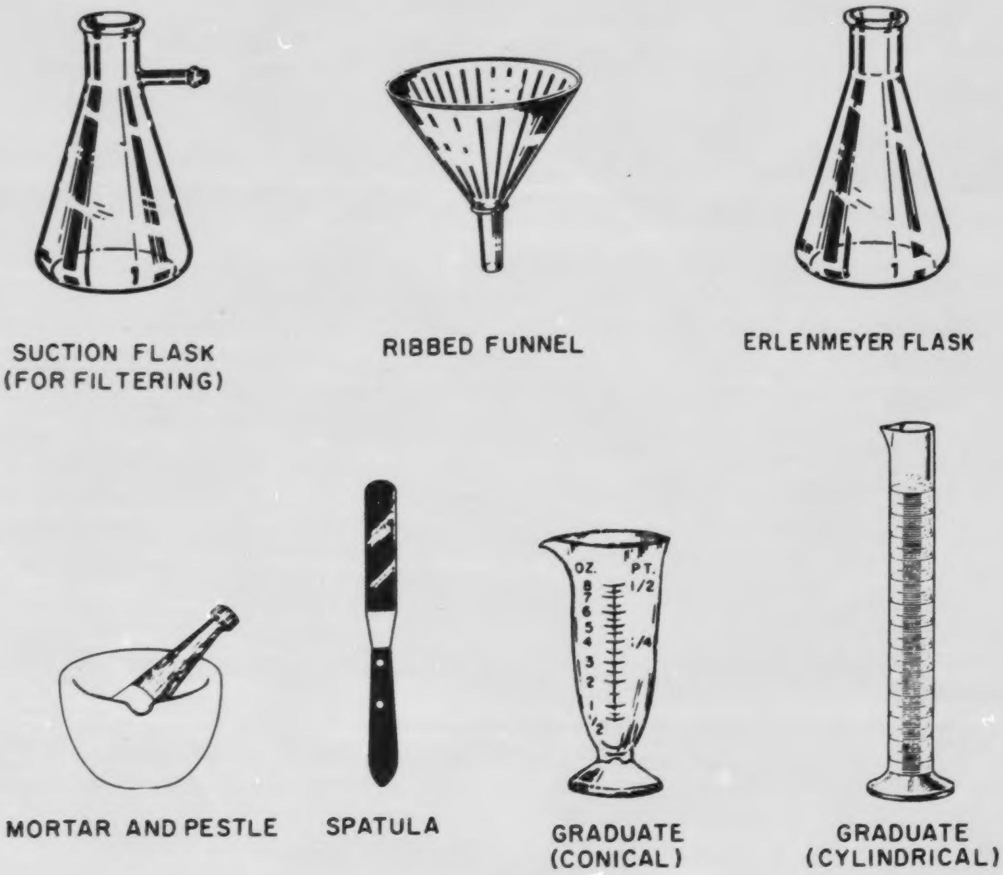
Now you are ready to become familiar with the tools or instruments of pharmacy. See figure 8-3.

Pill Tile

This is a flat rectangular or square slab of glass or porcelain. As the name implies, the tile is used as a work surface for compounding pill masses and powders for capsules. It is also an excellent work surface for triturating small quantities of powders with a spatula and levigating small amounts of ointments and suppository masses. The pill tile should never be scratched and should be cleaned and stored when not in use.

Spatula

A knife-like utensil with a rounded, flexible, smoothly ground blade, available in various sizes. The spatula is used to "work" powders, ointments, and creams in the process of levigation and trituration. It is also used to transfer quantities of drugs from their containers to the prescription balance. Spatulas are not to be used to pry open cans, as screwdrivers, or as knives for opening boxes. Once the surface is scratched



SUCTION FLASK (FOR FILTERING)

RIBBED FUNNEL

ERLENMEYER FLASK

MORTAR AND PESTLE

SPATULA

GRADUATE (CONICAL)

GRADUATE (CYLINDRICAL)

154.52

Figure 8-3.—Pharmacy Equipment.

or the edges bent, the spatula's precision surface is ruined and it becomes useless.

Mortar and Pestle

These two items always go together, one being useless without the other. The mortar is basically a heavy bowl, with one distinct property: the inside concavity is geometrically hemispheric. The accompanying pestle is primarily a handtool, whose tip is of identical material as the mortar, and its convexity forms a perfect hemisphere. The reason for the two opposing hemispheres is to provide an even grinding surface when in use. Mortars and pestles are made of glass, metal, or unglazed pottery called wedgewood. Glass is always used when triturating very pure products, such as eye ointments, and when the preparations contain stains. Metal ones should neve be used when the drugs are likely to react to the metals.

Graduates

These are conical or cylindrical clear glass containers, graduated to specified quantities, used to measure liquids volumetrically. Measuring should always be done at eye-level.

Wire Gauze

A wire gauze is placed under a container in order that the heating flame will distribute uniformly about the bottom of the container. The wire is a good conductor of heat, and the heat penetrates rapidly.

Pipettes

Pipettes are narrow, graduated tubes used for measuring small quantities of liquids volumetrically.

Suction flask

The suction flask is an Erlenmeyer flask with a tube extending from the neck at a right angle. The tube provides a connection site for attaching a means of suction. When a filtering apparatus is attached to the neck of the flask and suction applied, the filtering process is speeded up by the vacuum created in the flask by the suction.

Ribbed funnel

The ribbed funnel is a utensil used in filtering and is most commonly made of glass, but other substances (tin, copper, rubber) are occasionally used. The funnel is shaped so that the inside surface tapers at a 60 degree angle ending in a tapered delivery spout. The inside surface is "ribbed" to allow air to escape from between the glass and the filtering medium, thus improving the filtration process.

Pharmaceutical Baths

Baths are vessels in which any substance in a container can be heated uniformly by immersion into the conductive matter of the bath. Baths are commonly used when a substance cannot be heated above a certain temperature. For example, cocoa butter cannot be heated above 100 degrees F. during the manufacture of suppositories.

The most common type of bath is a circular bowl made of tinned copper. The bowl contains water and as this water is heated, the heat is transmitted to the container which is placed in the bath. Using this method, a constant temperature of 100 degrees C. can be maintained over long periods of time.

PHARMACEUTICAL BALANCES

There are two types of pharmaceutical balances in common use in the Navy; the single beam, equal arm balance and the torsion balance (fig. 8-4). These balances are classified as either "Class A" or "Class B." The Class A balance is used for weighing loads from 120 mg to 120 g. All dispensing pharmacies are required to have at least one Class A balance on hand at all times. The Class B balance is optional equipment in the pharmacy, used to weigh loads of more than 648 mg, and must be conspicuously marked "Class B."

Operation of the Torsion Balance

1. Place pre-cut protective paper over each of the pans.
2. Adjust the balance so that the indicator reads zero.

320

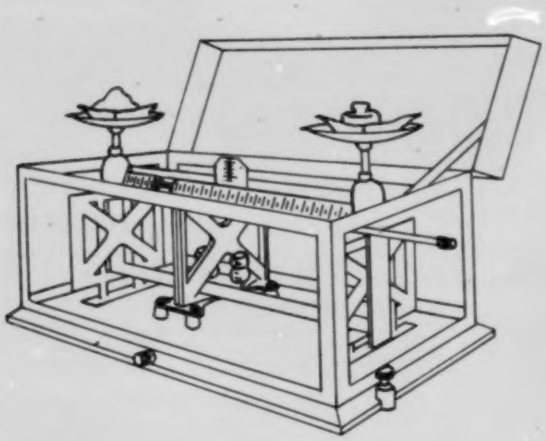


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Figure 8-4.—Pharmaceutical Balance.

3. Always place the weight on the right pan and the substance to be weighed always on the left pan (facing the balance).

4. When the rider on the scale is used, it should be returned to zero after each weighing.

5. Recheck the "balance" of the instrument after each substance is weighed.

6. Clean and properly secure the balance when weighing is completed.

Care of the balance

1. Never add or remove items from the balance pans unless the balance is locked. The lock control on the balance can be seen in figure 8-4. It is the small knob at the bottom front of the balance. When this knob is turned all the way to the right, the balance beams will not move and are referred to as "locked." When this knob is turned all the way to the left, the balance beams will move to give the operator a reading. This position is referred to as the "unlocked" position.

2. Keep in a closed case in a dry, protected place.

3. Never leave balance unlocked when not in use.

4. Handle weights with forceps to avoid collection of foreign matter than can cause inaccuracy.

5. Clean only with a dry rag. Never use any liquid on the balance.

6. Always protect pans with paper. Waxed paper is best.

7. If the balance is to be moved for any distance, consult *Remington's Pharmaceutical Sciences* for instructions on how to secure the balance to prevent damage.

PHARMACEUTICAL PREPARATIONS

WATERS (AQUAE)

Waters are aqueous solutions of volatile substance.

Methods of Preparation:

1. Distillation. Example: Rose water.

2. Solution. There are two methods of preparation by solution:

   a. Simple solution. Example: Peppermint water. Two ml of oil of peppermint are added to enough water to make 1000 ml of total mixture. Shake the mixture several times, allow to stand overnight, then filter.

   b. Alternate solution. Example: Peppermint water. Two ml of oil of peppermint are mixed with 15 grams of purified talc. Water, q.s. to make 1000 ml, is added to this mixture. Shake the mixture several times during a ten minute period and filter.

NOTE: The advantage of using the alternate method is that less time is required for preparation.

USES: Waters are generally used as vehicles.

TINCTURES

Tinctures, with a few exceptions (Tr. iodine, Tr. ferric chloride, etc.) are alcoholic solutions of animal or vegetable drugs. The drug strength of tinctures of potent or therapeutically active drugs is usually 10% and 20% for other tinctures.

Methods of Preparation:

Percolation; maceration; simple solution; dilution.

USES: Determined by their respective ingredients.

EXAMPLE: Tincture of Belladonna.

SPIRITS

Spirits are alcoholic or hydroalcoholic solutions of volatile substances. They are liquids, having the characteristic odor and color of the dissolved volatile substances.

Methods of Preparation:

Simple solution; maceration; chemical reaction; distillation.

USES: The use of each spirit is determined by its respective ingredients.

EXAMPLES: Spirit of Peppermint, prepared by solution; whiskey and brandy, prepared by distillation.

FLUID EXTRACTS

Fluid extracts are alcoholic solutions of vegetable drugs, of such strength that one ml of the solution contains the active ingredients of one gram of the crude drug.

Methods of Preparation

Fluid extracts are prepared by percolation with various menstruum. The percolate is either concentrated by evaporation or diluted with the menstruum to bring the fluid extract to the required strength.

USES: The use is determined by its respective ingredients.

EXAMPLES: Fluid extract of Belladonna, Fluid extract of Cascara Sagrada.

SYRUPS

Syrups are concentrated aqueous solutions of sucrose, containing flavoring or medicinal substances.

Methods of Preparation

In preparing syrups, the sucrose may be dissolved with the aid of heat, by agitation, or by percolation. The process to be used depends upon the ingredients of the syrup and the time available for completing its manufacture.

USES: Many of the syrups are used as vehicles. Their sweet taste causes them to be a preferred form for the administration of drugs.

EXAMPLES: Simple Syrup; Syrup of Orange.

ELIXIRS

Elixirs are aromatic, sweetened hydroalcoholic solutions containing medicinal substances. They are liquids having an aromatic odor and a pleasant taste. The color of elixirs varies according to the nature of the ingredients; some are artificially colored.

Methods of Preparation

Simple solution is the general process employed in preparing elixirs. Many are prepared, however, by adding the medicinal substances directly to aromatic elixir, which is an elixir-base. While elixirs are very simple to mix, it should be noted that most elixirs are very difficult to filter, and since most elixirs require filtration, suction filtration is the recommended method.

USES: Used internally. Their uses vary according to their ingredients.

EXAMPLE: Elixir of Terpin Hydrate

MAGMAS (AKA MILKS)

Magmas are thick, creamy, aqueous suspensions of inorganic substances in a very fine state. They are rather viscid and often resemble cream or milk. Magmas should be dispensed with a "Shake Well" label.

EMULSIONS

An emulsion is a liquid preparation containing two immiscible liquids, an oil and water, one of which is dispersed as globules in the other. The liquid broken up into globules is called the internal phase. The liquid in which the globules are dispersed is called the external phase. The third substance which keeps the internal and external phase from coalescing is the emulsifying agent. Emulsions are classified as oil in water (o/w) and water in oil (w/o). An emulsion would be an oil in water emulsion when water forms the external phase. A water in oil emulsion would occur when water is the internal phase and oil the external phase.

Methods of Preparatiaon

English (wet gum) method:

First the emulsifying agent is placed in a mortar and dispersed with sufficient water to form a mucilage. The oil is added in small quantities with continuous trituration, ensuring that each portion is thoroughly emulsified before adding more oil. Continue this process until all the oil has been emulsified.

Continental (dry gum) method:

First place all the oil in the mortar, add the emulsifying agent to it, and, using gentle trituration, disperse the agent in the oil. Add the water all at once and triturate vigorously until the emulsion is formed.

Emulsification is generally done to make disagreeable oils more palatable. Consequently, oil in water emulsions are most frequently used to dispense orally administered emulsions.

USES: Depend on ingredients

EXAMPLE: Emulsion of cod liver oil; cow's milk is an example of natural emulsion.

LOTIONS

Lotions are liquid preparations, usually aqueous, containing the insoluble substances intended for external application. The insoluble ingredients must be in very fine particles to prevent irritation to the skin. They are dispensed with "Shake Well" labels and "External Use Only" labels.

USES: The use of each lotion is determined by its respective ingredients.

EXAMPLE: Calamine lotion

SUSPENSIONS

Suspensions are coarse dispersions comprised of finely divided insoluble material suspended in a liquid medium. In order to keep the insoluble material in suspension, a third agent, called a suspending agent, is required.

Method of Preparation

There are no general methods for the preparation of suspensions; however, in order for the insoluble ingredients to remain in suspension they must be in a fine degree of subdivision. Suspensions are to be labeled "Shake Well."

USES: Suspensions are used for the administration of oral medicaments which have low solubility in water or aqueous vehicles. Also suspensions are used for parenteral drugs and opthalmic solutions.

LINIMENTS

Liniments are solutions or mixtures of various substances in oily, alcoholic, or emulsified form intended for external application.

Methods of Preparation

Liniments are prepared by simple solution.

USES: Usually applied with friction—rubbing of the skin. The oil base provides for ease of application and massage. Alcoholic liniments

323

are used topically for their rubifacient, mild astringent, and penetrating effects. Others are applied gently and are used solely as protective coating. Liniments are generally used as counter-irritants, anodynes, and to produce local action.

EXAMPLE: Camphor Liniment

OINTMENTS

Ointments are semisolid, fatty, or oily preparations of medicinal substances of such consistency as to be easily applied to the skin and gradually liquefy or melt at body temperature. Ointments vary in color according to their ingredients. The base of an ointment is generally of a greasy character, and the medicinal substances combined with it are always intended to be in very fine particles, uniformly distributed.

Methods of Preparation

Incorporation: The medicinal substances are finely powdered if necessary, and then they are levigated into the fatty base, either in the mortar or on the pill tile.

Fusion: The fatty base is melted, then the finely powdered ingredients are added and mixed thoroughly. The solution is cooled so that the base, now containing the medicinal substances, returns to its natural state.

USES: Ointments have long been a preferred form for the external application of medicinal substances. In addition to the action of the medicinal substances combined with them, the fatty bases are emollient and protective in nature.

EXAMPLE: Zinc Oxide Ointment

SUPPOSITORIES

They are solid bodies intended to introduce medicinal substances into the various orifices of the body. The ingredients are incorporated in a base that melts at body temperature. They are of the following types:

- rectal
- vaginal
- urethral

Methods of Preparation

Fusion method: The ingredients are added to melted theobroma oil (cocoa butter) and the mixture poured into the suppository mold. The mixture is allowed to cool, and the suppositories are removed from the mold.

Hand method: The medicinal ingredient is combined with theobroma oil, and the mixture is triturated into a pliable mass. The mass is rolled by hand into the shape of a cylinder and divided into the required number of equal parts which are then formed into the desired shape.

USES: Suppositories are commonly used for the local application of medicinal substances, as in the treatment of hemorrhoids. Occasionally, suppositories are used in administrating medicinal substances when administration by mouth is not practical.

CAPSULES

Capsules are gelatin shells containing solid or liquid medicinal substances to be taken orally. The most common type of capsule is that in which the medicine, in the form of a dry powder, is enclosed in transparent cases made of gelatin. They are in sizes universally designated by numbers: 5, 4, 3, 2, 1, 0, 00, 000. The number 5 has the capacity of about 65 mg of aspirin powder and the 00 about 975 mg of the same substance. It should be noted that only sizes 3 through 00 are available through the Federal Stock System.

INCOMPATABILITIES

An understanding of incompatabilities can save the pharmacy technician valuable time in compounding as well as insure the therapeutic efficiency of the products. Incompatabilities are divided into three classes: therapeutic, physical, and chemical.

THERAPEUTIC

This type of incompatability occurs when agents antagonistic to one another are prescribed together. Such circumstances seldom occur, but when they do it does not necessarily indicate a moment of forgetfulness on the part of the doctor. Such agents may have been used together in order for one agent to modify the activity of the other. When circumstances produce a feeling of doubt on the part of the pharmacy technician, the prescribing physician should be consulted.

PHYSICAL

Physical imcompatabilities are often called pharmaceutical incompatibilities and are evidenced by the failure of the drugs to combine properly. It is virtually impossible for uniform dosages of medicine to be given from such solutions or mixtures. Ingredients such as oil and water which are physically repellant to each other and substances which are insoluble in the prescribed vehicle are primary examples of physical incompatibilities.

CHEMICAL

This type of incompatibility exists when agents are prescribed which react chemically when mixed, altering the composition of one or more of the constituents.

MANIFESTATIONS OF INCOMPATIBILITY

- Insolubility of prescribed agent in vehicle (physical)
- Immiscibility of two or more liquids (physical)
- Precipitations due to change in menstruum which results in decreased solubility is called salting out (physical).
- Eutexia—the liquification of solids mixed in dry state (physical)
- Cementation of insoluble ingredients in liquid mixtures (physical)
- Evolution in color (chemical)
- Change in color (chemical)
- Oxidation-reduction, or explosive reaction (chemical)
- Precipitation due to chemical reaction (chemical)
- Inactivation of sulfa drugs by procaine HC1 (therapeutic)

Corrective Measures

- Addition of an ingredient which does not alter the therapeutic value, such as the addition of an ingredient to alter solubility of an agent
- Omission of an agent that has no therapeutic value, or that may be dispensed separately
- Change of an ingredient. Minor changes such as a soluble form of an ingredient for an insoluble form are included
- Change of a solvent
- The utilization of special techniques in compounding

PRACTICAL PHARMACY PROCEDURES

COMPOUNDING

- Read the prescription, formula, or recipe carefully. Be sure you understand its contents.
- Make sure that all ingredients required are on hand, in the quantities required.
- Any substitutions or changes must be approved by the prescriber and initialed.
- As you weigh or measure each ingredient, check it off the prescription. If any doubt exists as to what or how much as been used, discard and begin again. It is better waste some material than to chance a faulty medication.

- Be neat, precise, and methodical when compounding drugs. Haste not only makes waste here—it also endangers the patient.

- Adhere to the sequences of compounding the ingredients and the techniques prescribed by the formula or recipe—there is a reason, otherwise they wouldn't be specified.

- Strive for "pharmaceutically elegant" results, such as smooth ointments and creams, devoid of lumps and grit; clear solutions; uniformly shaped capsules, et cetera.

- Store and preserve your products in neat, clean containers, clearly labeled, readily accessible.

DISPENSING

- Remember that the contents of a prescription are a confidential matter between the physician, the patient, and the person who is filling it.

- All prescriptions must be dispensed neatly, in an appropriate container of suitable size.

- All prescriptions must be properly labeled and properly marked ("Shake Well," External Use Only," etc.)

- Never dispense drugs of doubtful origin or potency. Never use ingredients of doubtful origin or potency when compounding a prescription.

- Never dispense drugs suspected of deterioration, either due to faulty storage or use.

- WHEN IN DOUBT, THROW IT OUT!

- Always double-check the prescription for correctness, up to and including the patient, making sure that he or she is in fact the person for whom the drug is intended.

- Refer to BUMED Instruction 6701.51 series for information to be recorded on each prescription form at the time of dispensing.

CHAPTER 9

HEALTH RECORDS AND PHYSICAL EXAMINATIONS

THE HEALTH RECORD

The health record is an individual chronological record and a concise summary of all medical and dental examinations, evaluations, and treatment afforded to a member of the Navy or Marine Corps.

It provides valuable assistance to Medical Department personnel in conducting examinations, evaluating physical fitness, making diagnoses and rendering medical or dental care in the treatment of injury and disease.

The health record is of significant medicolegal value to the member concerned, his or her beneficiaries, and the Federal Government. Proper and equitable determination of claims based upon physical disability is largely dependent upon the information recorded in the health record.

Various officials and boards refer to information furnished by the health record in determining physical fitness.

It is often a determinant factor in the adjustment of internal revenue assessment and in the establishment of veteran's preference.

It affords basic data for the compilation of medical statistics.

The dental record is an invaluable aid in the identification of the deceased, especially when other means fail.

Accuracy is of utmost importance in the recording of all entries, especially for periods of combat.

The inclusion of special examinations, consultations, and laboratory and X-ray reports is vital to an individual's record. If they are not on adjunct health record forms, they should be transcribed into the record to prevent loss of information.

The various circumstances under which a health record may be opened, closed, and maintained are described in detail in the *Manual of the Medical Department (MANMED)*, chapter 16. Additional information is presented in the Navy Directives System.

Implementation of a new program may require modification of existing regulations to fit the particular need. Therefore all personnel associated with health record maintenance must keep abreast not only of MANMED but also of all directives to ensure that correct procedures are used.

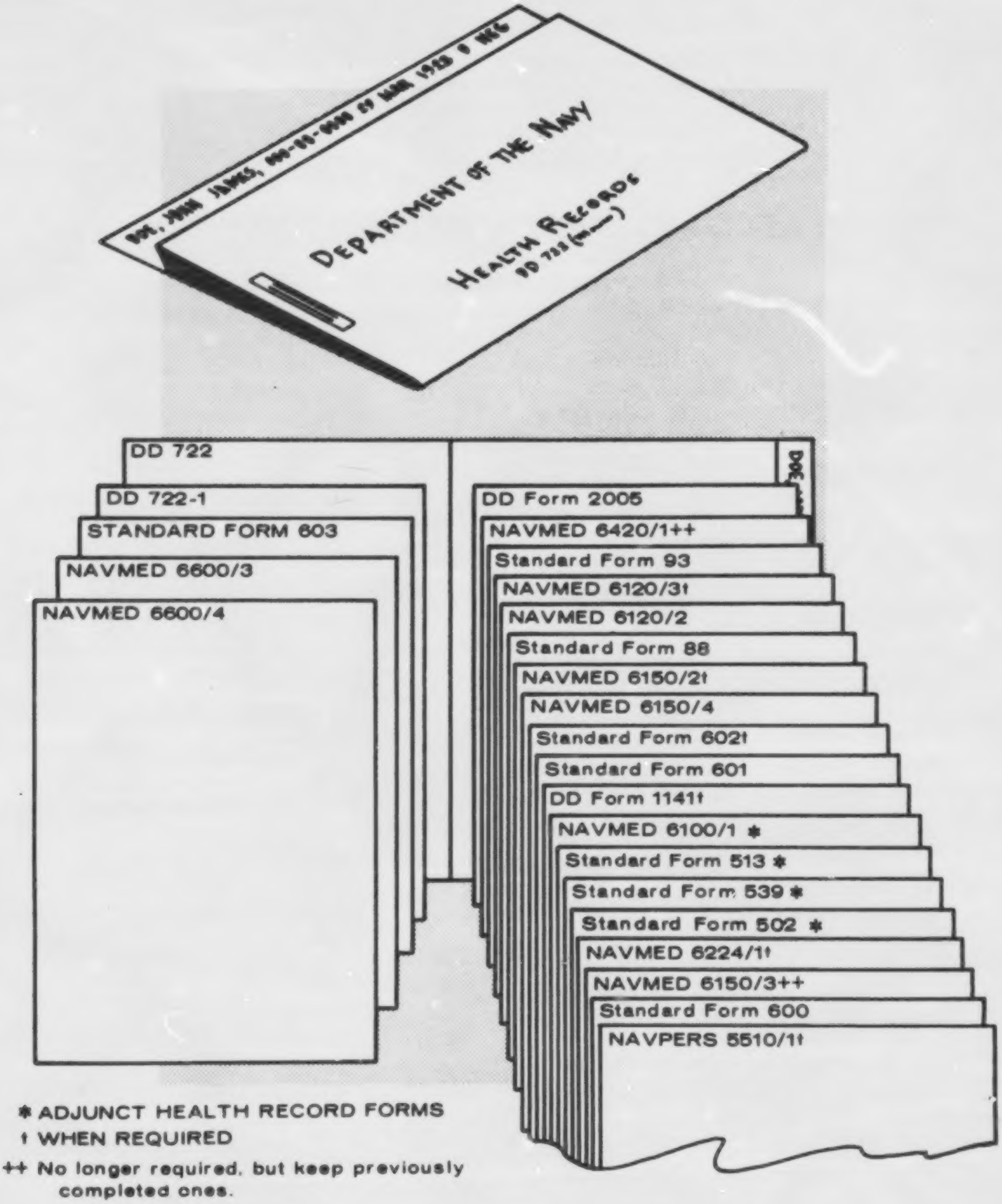
Contents

Each member's health record consists of the DD 722, Health Record Jacket, with the following dental records on the left side and the following medical records on the right side, arranged in top-to-bottom sequence (fig. 9-1):

LEFT SIDE, DENTAL:

DD Form 722-1	Dental Folder
Standard Form 603	Dental
NAVMED 6600/3	Dental Health Questionnaire
NAVMED 6600/4	Navy Peridontal Screening Examination

327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DEPARTMENT OF THE NAVY
HEALTH RECORDS
DD 722
DD 722
DD 722-1
STANDARD FORM 603
NAVMED 6600/3
NAVMED 6600/4
DOE
DD Form 2005
NAVMED 6420/1++
Standard Form 93
NAVMED 6120/3†
NAVMED 6120/2
Standard Form 88
NAVMED 6150/2†
NAVMED 6150/4
Standard Form 602†
Standard Form 601
DD Form 1141†
NAVMED 6100/1 *
Standard Form 513 *
Standard Form 539 *
Standard Form 502 *
NAVMED 6224/1†
NAVMED 6150/3++
Standard Form 600
NAVPERS 5510/1†
* ADJUNCT HEALTH RECORD FORMS
† WHEN REQUIRED
++ No longer required, but keep previously completed ones.

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Figure 9-1.—Contents of Health Record.

RIGHT SIDE, MEDICAL:

NAVPERS 5510/1†	Record Identifier for Personnel Reliability
Standard Form 600	Chronological Record of Medical Care
NAVMED 6150/3 ++	Sick Call Treatment Record
NAVMED 6224/1†	TB Contact/Converter or Follow-up Form
Standard Form 502†	Narrative Summary
Standard Form 539*	Abbreviated Medical Record
Standard Form 513*	Consultation Sheet
NAVMED 6100/1*	Medical Board Report
DD Form 1141†	Record of Occupational Exposure to Ionizing Radiation
Standard Form 601	Immunization Record
Standard Form 602†	Syphilis Record
NAVMED 6150/4	Abstract of Service and Medical History
NAVMED 6150/2†	Special Duty Medical Abstract
Standard Form 88	Report of Medical Examination
NAVMED 6120/2	Officer Physical Examination Questionnaire
NAVMED 6120/3†	Annual Certificate of Physical Condition
Standard Form 93	Report of Medical History
NAVMED 6420/1 ++	Report of all Diving Accidents
DD Form 2005	Privacy Act Statement-Health Care Record

*Adjunct health record forms.
†When required.
++ No longer required, but keep previously completed ones.

No other documents will be permanently incorporated in a health record except baseline audiograms, baseline and most recent electrocardiograms, and disclosure accounting documents as required by the Privacy Act of 1974. Cumulative official health record forms will be filed in their assigned sequence, and the most recent will be placed on top of each previous form.

All dates recorded on the component forms of the health record will be entered in the following sequence: day (numeral), month (in capitals, abbreviated to the first three letters), and year (numeral); e.g., 4 JAN 80.

Verification

When practicable, the health record is verified at the same time as the service record and pay records. Verification is also accomplished upon reporting, at the time of physical examination, and upon detachment. The health records of class II Marine Corps reservists are verified at the time of the annual audit of the Ready Reserve.

Each record will be carefully reviewed, and any errors or discrepancies noted will be corrected. Special attention will be given to ensure accuracy of the name, social security number, designator or military occupational specialty, date and place of birth, blood group and Rh factor, and recording of newly acquired marks or scars. A signed entry to the effect that verification has been accomplished will be recorded in the designated space of the left inner surface of the Health Record Jacket.

Release of Medical Information

Commanding officers and officers in charge of Navy and Marine Corps activities are designated as local system managers for individual health records maintained and serviced within their activities. Custodians of individual health records are responsible for familiarizing themselves with SECNAVINST 5211.5 series and complying with the provision for preserving the privacy of the information contained in these records.

Local system managers are authorized to release information from health records located within the command if a proper show of authority has been established. The requesting office or individual will be advised that such information is private and confidential and must be treated accordingly.

The information necessary to accomplish a legitimate purpose or, if required, a complete transcript of an individual's health record may be furnished in accordance with the following policy guidelines:

1. Release to the Public. Information contained in health records of individuals who have undergone medical or dental examinations or treatment is personal to the individual and therefore of a private and confidential nature. Consequently, disclosure of such information to the public would constitute an unwarranted invasion of personal privacy. Such information is exempt from release under the Freedom of Information Act.

2. Release to the Individual Concerned. Release of health care information to the individual concerned falls within the purview of the Privacy Act and not the Freedom of Information Act. If individuals request information from their health records, it will be released to them unless, in the opinion of the releasing authority, it might prove injurious to their physical or mental health. In such an event, and if the circumstances indicate it to be in their best interests, the individuals will be requested to authorize the release of the information to their personal physician.

3. Release to Representatives of the Individual Concerned. Upon the written request of the individuals concerned or their legal representatives, health care information will be released to authorized representatives. If the individual is mentally incompetent, insane, or deceased, the next of kin or legal representative must authorize the release in writing. Next of kin or a legal representative must submit adequate proof that the member or former member has been declared mentally incompetent or insane, or furnish adequate proof of death if such information is not on file. Legal representatives must also provide proof of appointment, such as a certified copy of the court order.

4. Release to Other Government Departments and Agencies. Health care information will be released, upon request, to other government departments and agencies having a proper and legitimate need for the information as listed in the "Routine Uses" section of the Medical Treatment Records System promulgated by SECNAVNOTE 5211, subj: Systems of Personal Records Authorized for Maintenance Under the Privacy Act of 1974, 5 USC 552a (PL 93-579).

If the releasing authority is in doubt whether the requesting department has a proper and legitimate need for the information, it will ask the requesting department to specify the purpose for which the information will be used. In appropriate cases, the requesting department will be advised that the information will be withheld until the written consent of the individual concerned is obtained.

In honoring proper requests, the releasing authority will disclose only information relative to the request. In the following instances departments and agencies, both Federal and State, may have a proper and legitimate need for the information:

a. Health care information is required to process a governmental action involving the individual. (The Veterans' Administration and the Bureau of Employees' Compensation process claims in which the claimant's medical or dental history is relevant.) If an agency requests health care information solely for employment purposes, a written authorization from the individual concerned will be required.

b. Health care information is required to treat an individual in the department's custody. (Federal and State hospitals and prisons may need the medical or dental history of their patients and inmates.)

5. Release to Federal or State Courts or Other Administrative bodies. The foregoing limitations are not intended to prevent compliance with lawful court orders for health records in connection with civil litigation or criminal proceedings, or to prevent release of

information from health records when required by law. Whenever the releasing authority is in doubt whether the subpoena or other compulsory process has been issued by a court of competent jurisdiction or by a responsible officer of an agency or body having power to compel production, the Judge Advocate General (JAG) of the Navy (or other cognizant legal officer) will be consulted.

6. Copies of Health Records. Upon request an individual or the authorized representative entitled to have access to health records will be furnished copies of these records.

Commanding officers of Medical Department treatment facilities are authorized to release information from health records located within the command to members of their staff who are conducting research projects. Where possible, the names of parties should be deleted. All other requests from research groups will be forwarded to BUMED for appropriate action. Release of medical reports or information concerning civilian appointees or employees is controlled by provisions in the *Federal Personnel Manual.* Attention is invited to pertinent articles in *U.S. Navy Regulations* (NAVREGS) and the *JAG Manual* for additional information concerning the release of information from naval medical or dental records.

OPENING THE HEALTH RECORD

A health record is opened when an individual becomes a member of the naval service, when a member on the retired list is returned to active duty, or when the original record has been lost or destroyed. All applicable spaces on each of the component forms designated for personal identification data will be completed. Official abbreviations of grade or rating will be used. The social security numbers of officers will be followed by the designator code or MOS, as appropriate, except on SF 88 where the designator code or MOS will follow the grade and component in block 2.

When the initial health record is opened it will consist of a DD 722-1 (Dental Folder) containing the original SF 603, and DD 722 (Health Record Jacket) containing component forms assembled in top-to-bottom sequence as follows: SF 600, SF 601, NAVMED 6150/4, SF 88, and SF 93.

Officers

A health record will be opened at the time of acceptance of appointment for individuals appointed from civilian life, and the record will be forwarded to the initial place of active duty. If the member is appointed and retained on inactive duty, the record will be disposed of as follows:

- Class II Marine Corps reservists—forward to or retain at the Organized Marine Corps Reserve unit to which assigned.
- Class III Marine Corps reservists—forward with the service record to Marine Corps Reserve Forces Administrative Activity, Class III, 1500 East Bannister Road, Kansas City, MO 64131.
- Naval reservists assigned to a drilling unit of the Selected Reserve in pay or nonpay status—forward to the unit to which assigned.
- Naval reservists assigned to a specialist or composite unit—deliver to the commanding officer for transmittal in the same package with the service record to cognizant naval district commandant.
- Naval reservists assigned to 19XX designator—deliver to the commanding officer for transmittal in the same package with the service record to cognizant naval district commandant.
- Naval reservists not included above—deliver to the commanding officer for transmittal with the service record to the Naval Reserve Personnel Center, 4400 Dauphine St., New Orleans, LA 70149.

When a midshipman or an enlisted member is appointed to commissioned or warrant grade, the existing health record will be continued in use. The activity having custody of the record at the time of acceptance of appointment will make necessary entries to indicate the new grade and the designator or MOS and prepare summary information entries on SF 600 and NAVMED 6150/4 to include date, place, and grade to which appointed.

Health records of civilian candidates selected for appointment to the Naval Academy will be prepared at the Naval Academy at the time of appointment. Health records for civilian applicants selected for an officer candidate program will be opened upon enrollment in the particular program. Instructions for this opening are found in MANMED, *U.S. Navy Recruiting Manual,* and *Naval Reserve Recruiting Instructions.*

Enlisted Members

The health record will be opened by the activity executing the enlistment contract upon original enlistment in the naval service. However, the health records of members who are enlisted or inducted and ordered to immediate active duty at a recruit training facility will be opened by the naval training center or MARCORPS recruit depot, as appropriate.

In all cases the original SF 88 and SF 93 will be attached to the enlistment contract and forwarded with other entrance documents to NMPC or Headquarters MARCORPS. Copies of SF 88 and SF 93 will be forwarded to the appropriate naval training center or recruit depot. These forms with other applicable health record forms will be incorporated into the member's health record.

The health records of persons enlisted or reenlisted in a Reserve component and retained on inactive duty will be disposed of as follows:

- Class II Marine Corps reservists—forward to the Organized Marine Corps Reserve unit to which assigned.

- Class III Marine Corps reservists—forward with the service record to Marine Corps Reserve Forces Administrative Activity, Class III, 1500 East Bannister Road, Kansas City, MO 64131.

- Naval reservists assigned to a drilling unit of the Selected Reserve in pay or nonpay status—forward to the unit to which assigned.

- Naval reservists assigned to a specialist or composite unit and Naval Reserve Officer School personnel—deliver to the commanding officer for transmittal in the same package with the service record to the cognizant naval district commandant.

- Naval reservists not included above—forward to the commanding officer for transmittal with the service record to the Naval Reserve Personnel Center, 4400 Dauphine St., New Orleans, LA 70149.

CLOSING THE HEALTH RECORD

The Health Record will be closed when a member:

- dies;
- is discharged;
- resigns;
- is released to inactive duty;
- is retired;
- is transferred to the Fleet Reserve and released to inactive duty;
- is declared missing or missing in action;
- is declared a deserter or;
- is disenrolled as an officer candidate or midshipman.

Closing entries will be recorded on NAVMED 6150/4. Entries will include the date of separation, title of servicing activity, and explanatory circumstances as may be indicated.

Discharge or Death

Upon final discharge or death, the entire health record, including DD 722 (Health Record

Jacket) and DD 722-1 (Dental Folder), will be delivered to the command maintaining the member's service record (no later than the day following separation) for inclusion in and transmittal with the member's service record. In case of death, a copy of the death certificate will accompany the transmitted records.

Additionally, upon release, discharge, or retirement the member will be provided with a copy of the separation physical examination (SF 88) and the most recent Report of Medical History (SF 93).

Before forwarding the health record, check each form for accuracy, completeness of name, grade or rate, and Social Security number. Make sure the sick call treatment and dental records are included.

Desertion

When a member is officially declared a deserter, an explanatory entry of this fact will be recorded on SF 600 and NAVMED 6150/4. The health record (including the dental record) will be retained on board the parent unit (except deployed submarines) for 180 days. Disposition after 180 days will be in accordance with instructions in MANMED, the *Navy and Marine Corps Pay Procedures Manual,* the *Naval Supply Systems Command Manual,* and the *Bureau of Naval Personnel Manual.*

A deserter will be physically examined at the first activity assuming jurisdiction of the member following surrender or apprehension. A statement will be prepared by the medical examiner setting forth the purpose and findings of the examination. A specific opinion about the member's physical fitness for confinement and ability to perform active duty at sea, on foreign service, or in the field, as appropriate, will be recorded on SF 600 for inclusion in the health record.

Supernumeraries

When a patient in a naval hospital is separated from the naval service but retained in the hospital for further treatment and hospitalization, the health record will be closed on the effective date of the separation and forwarded to the command maintaining the member's service record. In such cases a new health record will not be prepared. However, the medical history will be continued on SF 600 and forwarded for inclusion in the health record upon the former member's discharge from the hospital.

A copy of a clinical summary prepared incident to the hospitalization of a member whose name is carried on the Temporary Disability Retired List will be forwarded upon termination of hospitalization as follows: Navy—Naval Reserve Personnel Center, 4400 Dauphine St., New Orleans, LA 70149; or Marine Corps—Headquarters Marine Corps (Code MMSR), Navy Department, Washington, DC 20380.

CUSTODY OF HEALTH RECORD

The health record is retained in the custody of the medical officer of the ship or station to which the member is attached. If the ship or station has a dental facility, DD 722-1 containing the dental record is placed in the custody of the dental officer. On ships or stations without a medical officer, the health record may be placed in the custody of the Medical Department representative at the discretion of the commanding officer. When Medical Department personnel are not assigned, the commanding officer may assign custody of the health records to other local representatives of the Medical Department who generally furnish medical support.

Health records are subject to inspection at any time by the commanding officer, his or her superiors in the chain of command, the fleet medical officer, or other duly authorized medical inspectors. Otherwise the health record is for official use only, and adequate security and custodial care are required.

There are many ideas on the method of adequate security and custodial control. In general, health records should be stored in such a manner as to be inaccessible to the crew or general public. No records or record pages should be left lying around. This also helps to prevent loss or misplacement of records.

Medical Department personnel will maintain a Health Record Receipt, File Chargeout, and Disposition Record, NAVMED 6150/7, for each health record in their custody.

All signatures in the health record will be signed in black or blue-black ink. The name and grade or rating of Medical Department officers and other authorized personnel making entries in the health record will be typed, printed, or stamped below their signature. Stamped facsimile signatures will not be used on any medical or dental forms of the health record. The signing individual assumes responsibility for the correctness of the entry.

If an erroneous entry is noted on review of a health record, draw a single diagonal line through it, making sure not to obliterate any part of that entry. An additional entry will be made on an SF 600 showing wherein and to what extent the original entry is erroneous. On the left side of the form containing the erroneous entry, the date and SF 600 page number of the correcting entry as well as the signature, including grade/rate, of the Medical Department representative making the change will be recorded. If an error is made at the time a handwritten entry is being placed on a health record form, draw a single line through the erroneous word or phrase, put your initials above the corrected error, and continue with the entry. Corrections of typographical or clerical errors (e.g., transposition of numbers or letters) are authorized (fig. 9-2).

Medical officers or Medical Department representatives are responsible for the completeness of required health record entries while the record remains in their custody.

Cross-Servicing Health Records

The health record of a naval member is serviced by personnel of the Medical Department of the Navy insofar as possible. However, if a naval member is performing an assignment with the Army or the Air Force, or if the medical facilities of either of these only are available, the health record may be serviced by Army or Air Force Medical Department personnel if the attendant service interposes no objection and considers the procedure feasible. Reciprocal procedure for servicing the health records of Army or Air Force personnel by personnel of the Medical Department of the Navy will be maintained whenever feasible and if requested by authorized representatives of those services. DD 689 is not prepared whenever direct cross-servicing of the health record is performed.

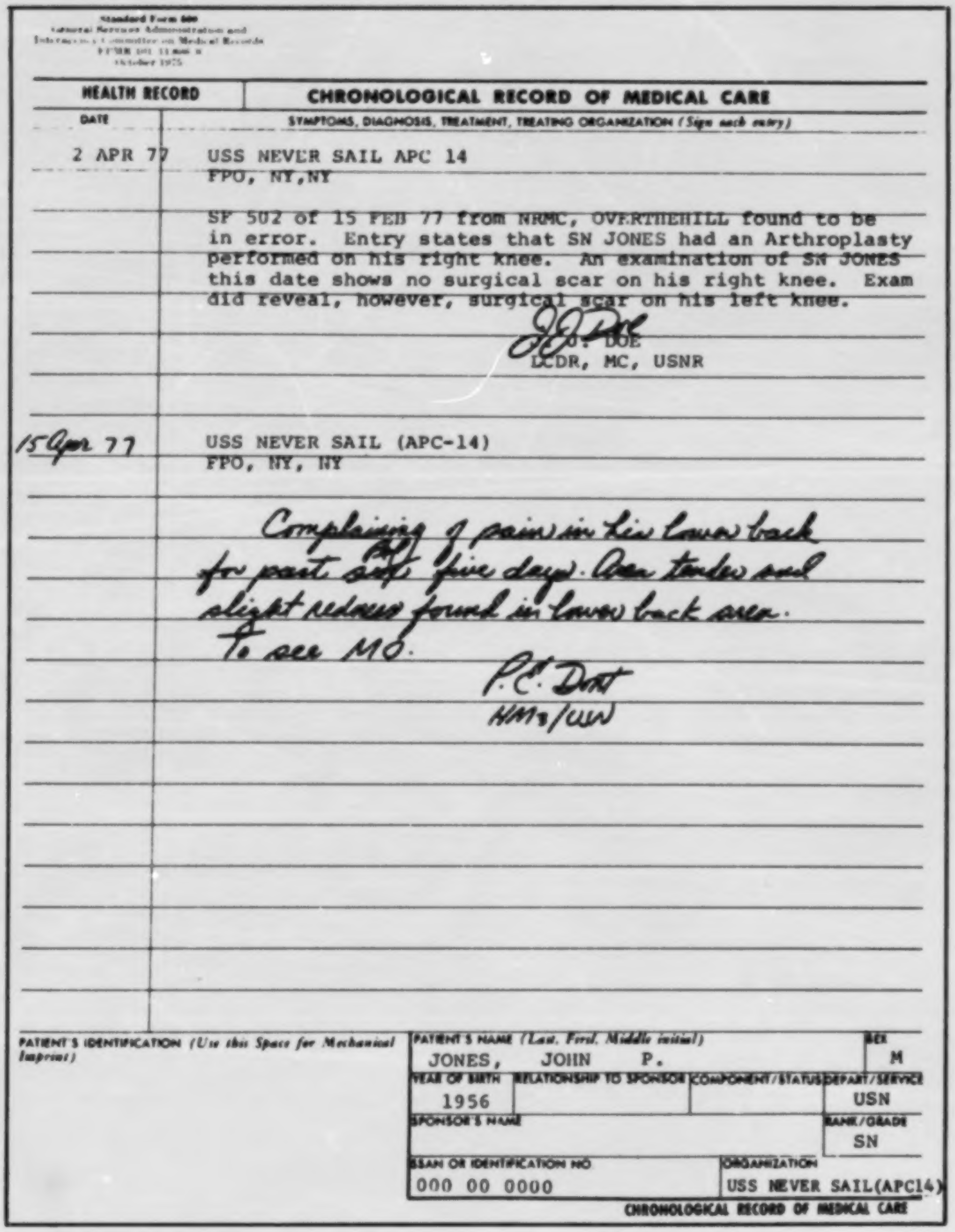
Transfers to Ships or Stations

When a member is transferred, the medical officer or Medical Department representative will assemble the member's health and dental records and screen them to determine the member's medical acceptability for transfer. The member does not have to be present when the records are screened. An entry indicating that the records have been screened will be made on SF 600, dated, and signed. The assembled records will be provided to the member or the cognizant personnel officer responsible for the transfer and will include the following additional entries, as applicable:

- Date of detachment and new duty station on NAVMED 6150/7
- Date and nature of detachment on NAVMED 6150/4
- All pages included in the record must be in correct sequence, with proper identification data entered on each page.

Lost, Damaged, or Destroyed Records

When a health record is lost or destroyed, the custodian will open a replacement health record. The designation REPLACEMENT will be prominently entered on the jacket and all forms replaced. A brief explanation of the



Standard Form 600
General Services Administration and
Interagency Committee on Medical Records
FPMR 101-11.806-8
October 1975

HEALTH RECORD | **CHRONOLOGICAL RECORD OF MEDICAL CARE**

DATE	SYMPTOMS, DIAGNOSIS, TREATMENT, TREATING ORGANIZATION *(Sign each entry)*
2 APR 77	USS NEVER SAIL APC 14 FPO, NY,NY SF 502 of 15 FEB 77 from NRMC, OVERTHEHILL found to be in error. Entry states that SN JONES had an Arthroplasty performed on his right knee. An examination of SN JONES this date shows no surgical scar on his right knee. Exam did reveal, however, surgical scar on his left knee. J. J. Doe J. J. DOE LCDR, MC, USNR
15 Apr 77	USS NEVER SAIL (APC-14) FPO, NY, NY Complaining of pain in his lower back for past ~~six~~ PCD five days. Area tender and slight redness found in lower back area. To see MO. P.C. Dent HM3/USN

PATIENT'S IDENTIFICATION *(Use this Space for Mechanical Imprint)*

PATIENT'S NAME *(Last, First, Middle initial)* JONES, JOHN P.			SEX M
YEAR OF BIRTH 1956	RELATIONSHIP TO SPONSOR	COMPONENT/STATUS	DEPART./SERVICE USN
SPONSOR'S NAME			RANK/GRADE SN
SSAN OR IDENTIFICATION NO 000 00 0000		ORGANIZATION USS NEVER SAIL(APC14)	

CHRONOLOGICAL RECORD OF MEDICAL CARE

154.67

Figure 9-2.—Correcting Entry.

circumstances requiring a replacement and date accomplished will be entered on SF 600. If the missing record is subsequently recovered, the information or entries in the replacement record will be inserted in the original record. Since BUMED no longer maintains copies of current health records, it cannot furnish replacements for lost or destroyed original records.

A health record or any portion thereof will be duplicated whenever it approaches a state of illegibility or deterioration that may endanger its future use or value as a permanent record. The duplicate health record or duplicate portion thereof will be a like reproduction of the original insofar as possible. Particular attention to detail will be used in the actual transcription. When an entire health record is duplicated, the designation DUPLICATE will be prominently entered on the jacket and all forms duplicated. When only component forms are duplicated, they will be individually identified as DUPLICATE. The circumstances necessitating the duplication and the date accomplished will be entered on SF 600. The original health record or any portion replaced by a duplicate will be placed in a plain envelope for protection and preservation and made a permanent part of the health record. On the front of the envelope, record the member's full name, other identifying data, and list of original records contained in the envelope. Mark the envelope "ORIGINAL HEALTH RECORDS—PERMANENT."

HEALTH RECORD JACKET (DD FORM 722) AND DENTAL FOLDER (DD FORM 722-1)

A new Health Record Jacket or Dental Folder is prepared when a person enters or reenters the naval service and when either the existent jacket or the folder has been damaged or is deteriorating to a point of illegibility. In the latter instance the old jacket or folder will be destroyed following replacement.

The member's full name (last, first and middle name, in that order) followed by the Social Security number, date of birth, blood group and Rh type, as noted below, will be entered on the lip of the Health Record Jacket. The same data, less blood group and Rh type, will be entered on the lip of the Dental Folder.

JONES, HARRY WILLIAM
111-22-3333 29 Mar 23 O NEG

JONES, Harry William, Jr.
111-22-3333 29 Mar 23 O Neg

JONES, Harriet Marie
111-22-3333 23 MAR 29 Blood Group B Neg

JONES, "T" "X" III
111-22-3333 1 APR 30 O Neg

The above information may be typed, printed, stamped, or attached by gum label or a combination thereof.

RECORD IDENTIFIER FOR PERSONNEL RELIABILITY (NAVPERS 5510/1)

The purpose of this form is to readily identify members of the Navy and Marine Corps assigned to the Personnel Reliability Program in accordance with applicable service directives. Medical officers and Medical Department representatives will familiarize themselves with the *Personnel Reliability Manual*, NAVMED P-5090, for proper administration of this program. This form is to be retained as the uppermost form in the health record at all times. If the member is no longer in the program, remove and destroy NAVPERS 5510/1 and make appropriate explanatory entries on SF 600.

REPORT OF MEDICAL EXAMINATION (SF 88)

The Report of Medical Examination (figs. 9-3 and 9-3A) is to be prepared whenever a complete report of physical examination is required by the Bureau for health record purposes. When not otherwise indicated, each physical examination will be recorded on SF 600.

This form is self-explanatory, but its proper completion requires careful scrutiny and review of the data to ensure completeness of the form. Specific requirements for submission and disposition of the forms in the major categories are tabulated in MANMED, chapter 15.

The following items are most likely to present the greatest potential for recording error. These items should be used for information and guidance in preparing the form.

ITEM 8 (Race) will be confined to one of the following:

- Caucasian. (Puerto Rican White will be recorded as Caucasian)
- Negroid. (Puerto Rican Black will be recorded as Negroid)
- Mongolian. (Chinese, Japanese, Korean, and Eskimo)
- Indian. (American Indian only)
- Malayan. (Filipino, Samoan, Hawaiian, and Chamorro)

ITEM 9 (Total Years Government Service)—In "Military" block enter the time (years and months) served in any branch of the U.S. military services, to include both active and inactive service; e.g., USAF 3y 3m, USA 3y 3m, USN & USNR 3y 3m. The "Civilian" block is ordinarily left blank.

ITEM 10 (Agency)—Leave blank.

ITEM 12 (Date of Birth)—Use the following format: 6 JUN 80

ITEM 13 (Place of Birth)—Enter city, town, or village, and State. If rural, the name of the county may be used. For foreign-born, enter the name of the country as known at the time of the individual's birth.

ITEM 14 (Name, Relationship, and Address of Next of Kin)—List as reported on the member's current Record of Emergency Data in the service record.

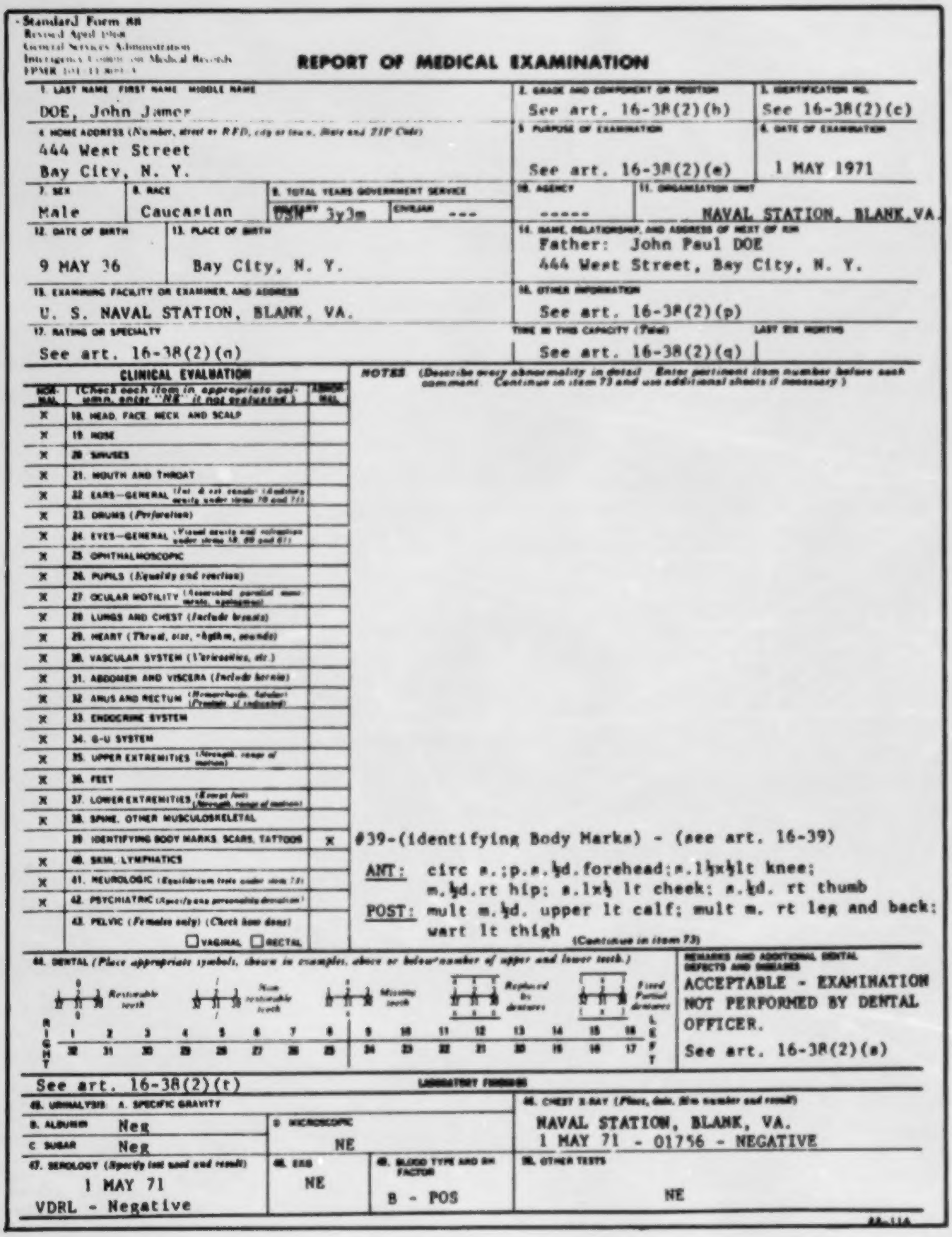
ITEM 16 (Other Information)—Religion is shown as "P" for Protestant, "C" for Catholic, or "H" for Hebrew. The specific denomination of any religion (i.e., Baptist, Lutheran, Methodist, Presbyterian), although desirable, is not required, unless requested by the individual. The religion of persons belonging to other religious faiths will be fully recorded. If a person does not desire to state a religious preference, the space is left blank. The word "None" is used only if the person claims no religious convictions.

ITEM 17 (Rating or Speciality)—Use only for designated aviation personnel and for qualified submarine and diving personnel. (See NAMMED, chapter 16, for details.)

ITEMS 18-43 (Clinical Evaluation)—Enter "NE" for items not evaluated. Be careful to check item evaluated. The medical examiner will describe each abnormality in the space designated "Notes" on the face of the form; if additional space is required, continue in item 73. Marks and scars indicated in block 39 are also shown under "Notes," using the descriptive designations outlined in MANMED art. 16-39 (fig. 9-4).

ITEM 44 (Dental)—If a dental officer is not available, the examinee's dental qualifications, other than of candidates of the U.S. Naval Academy, will be determined by the medical officer and entered under "Remarks" of item 44 with the statement, "Examination not performed by dental officer." Also under "Remarks" show Type of Examination and Dental Classification. (See MANMED, chapter 6.)

ITEM 74 (Summary of Defects and Diagnoses)—All defects and diagnoses found must be recorded and described adequately. The defects are listed in the summary in the order of their importance. Disqualifying and permanent defects are listed first. All minor defects noted are recorded to protect the Government in the event of future claims for disability compensation. When an individual has a disease or other physical condition that is not disqualifying but requires medical treatment, the nature of the condition and the need for treatment will be clearly stated. For all aviation physical examinations, a space of 4 inches on the right side is



Standard Form 88
Revised April 1968
General Services Administration
Interagency Comm. on Medical Records
FPMR 101-11.806-8

REPORT OF MEDICAL EXAMINATION

1. LAST NAME FIRST NAME MIDDLE NAME: DOE, John James
2. GRADE AND COMPONENT OR POSITION: See art. 16-38(2)(b)
3. IDENTIFICATION NO.: See 16-38(2)(c)
4. HOME ADDRESS (Number, street or RFD, city or town, State and ZIP Code): 444 West Street, Bay City, N. Y.
5. PURPOSE OF EXAMINATION: See art. 16-38(2)(e)
6. DATE OF EXAMINATION: 1 MAY 1971
7. SEX: Male
8. RACE: Caucasian
9. TOTAL YEARS GOVERNMENT SERVICE: MILITARY USN 3y3m CIVILIAN ---
10. AGENCY: -----
11. ORGANIZATION UNIT: NAVAL STATION, BLANK, VA.
12. DATE OF BIRTH: 9 MAY 36
13. PLACE OF BIRTH: Bay City, N. Y.
14. NAME, RELATIONSHIP, AND ADDRESS OF NEXT OF KIN: Father: John Paul DOE, 444 West Street, Bay City, N. Y.
15. EXAMINING FACILITY OR EXAMINER, AND ADDRESS: U. S. NAVAL STATION, BLANK, VA.
16. OTHER INFORMATION: See art. 16-38(2)(p)
17. RATING OR SPECIALTY: See art. 16-38(2)(o)
TIME IN THIS CAPACITY (Total): See art. 16-38(2)(q)
LAST SIX MONTHS:

CLINICAL EVALUATION

NORMAL	(Check each item in appropriate column, enter "NE" if not evaluated.)	ABNORMAL
X	18. HEAD, FACE, NECK AND SCALP	
X	19. NOSE	
X	20. SINUSES	
X	21. MOUTH AND THROAT	
X	22. EARS—GENERAL (Int. & ext. canals) (Auditory acuity under items 70 and 71)	
X	23. DRUMS (Perforation)	
X	24. EYES—GENERAL (Visual acuity and refraction under items 59, 60 and 67)	
X	25. OPHTHALMOSCOPIC	
X	26. PUPILS (Equality and reaction)	
X	27. OCULAR MOTILITY (Associated parallel movements, nystagmus)	
X	28. LUNGS AND CHEST (Include breasts)	
X	29. HEART (Thrust, size, rhythm, sounds)	
X	30. VASCULAR SYSTEM (Varicosities, etc.)	
X	31. ABDOMEN AND VISCERA (Include hernia)	
X	32. ANUS AND RECTUM (Hemorrhoids, fistulae) (Prostate, if indicated)	
X	33. ENDOCRINE SYSTEM	
X	34. G-U SYSTEM	
X	35. UPPER EXTREMITIES (Strength, range of motion)	
X	36. FEET	
X	37. LOWER EXTREMITIES (Except feet) (Strength, range of motion)	
X	38. SPINE, OTHER MUSCULOSKELETAL	
	39. IDENTIFYING BODY MARKS, SCARS, TATTOOS	X
X	40. SKIN, LYMPHATICS	
X	41. NEUROLOGIC (Equilibrium tests under item 72)	
X	42. PSYCHIATRIC (Specify any personality deviation)	
	43. PELVIC (Females only) (Check how done) ☐ VAGINAL ☐ RECTAL	

NOTES (Describe every abnormality in detail. Enter pertinent item number before each comment. Continue in item 73 and use additional sheets if necessary.)

#39-(identifying Body Marks) - (see art. 16-39)

ANT: circ s.;p.s.½d.forehead;s.1½x½lt knee;
m.½d.rt hip; s.1x½ lt cheek; s.½d. rt thumb
POST: mult m.½d. upper lt calf; mult m. rt leg and back;
wart lt thigh (Continue in item 73)

44. DENTAL (Place appropriate symbols, shown in examples, above or below number of upper and lower teeth.)

Restorable teeth; Non-restorable teeth; Missing teeth; Replaced by dentures; Fixed Partial dentures

RIGHT 1 2 3 4 5 6 7 8 | 9 10 11 12 13 14 15 16 LEFT
32 31 30 29 28 27 26 25 | 24 23 22 21 20 19 18 17

REMARKS AND ADDITIONAL DENTAL DEFECTS AND DISEASES: ACCEPTABLE - EXAMINATION NOT PERFORMED BY DENTAL OFFICER.
See art. 16-38(2)(s)

See art. 16-38(2)(t)

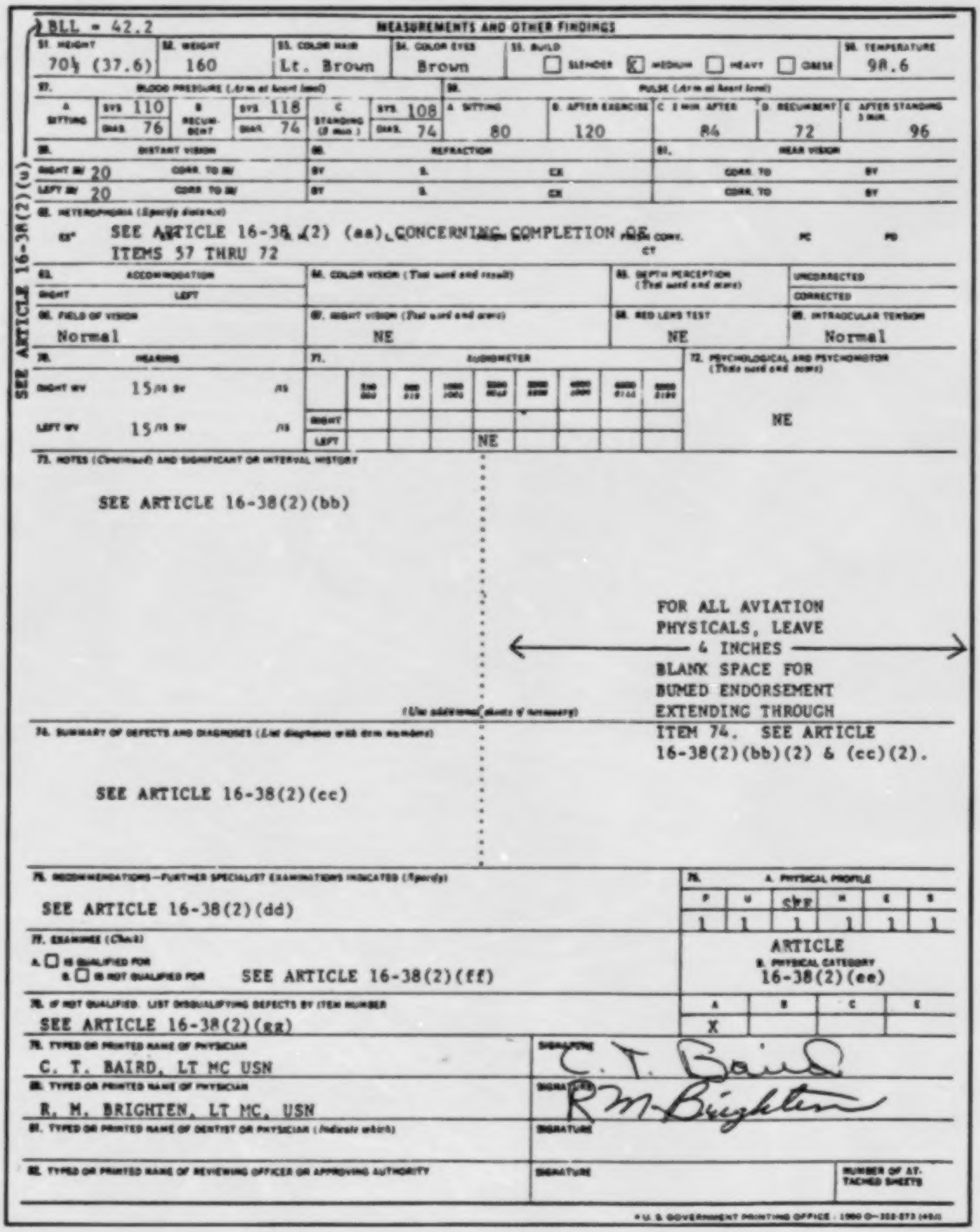
LABORATORY FINDINGS

45. URINALYSIS: A. SPECIFIC GRAVITY
B. ALBUMIN: Neg
C. SUGAR: Neg
D. MICROSCOPIC: NE
46. CHEST X-RAY (Place, date, film number and result): NAVAL STATION, BLANK, VA. 1 MAY 71 - 01756 - NEGATIVE
47. SEROLOGY (Specify test used and result): 1 MAY 71 VDRL - Negative
48. EKG: NE
49. BLOOD TYPE AND RH FACTOR: B - POS
50. OTHER TESTS: NE

88-11A

154.64

Figure 9-3.—Report of Medical Examination (Front).



BLL = 42.2

MEASUREMENTS AND OTHER FINDINGS

51. HEIGHT: 70½ (37.6)
52. WEIGHT: 160
53. COLOR HAIR: Lt. Brown
54. COLOR EYES: Brown
55. BUILD: ☐ SLENDER ☒ MEDIUM ☐ HEAVY ☐ OBESE
56. TEMPERATURE: 98.6

57. BLOOD PRESSURE (Arm at heart level)

A. SITTING		B. RECUMBENT		C. STANDING (3 min.)	
SYS.	110	SYS.	118	SYS.	108
DIAS.	76	DIAS.	74	DIAS.	74

58. PULSE (Arm at heart level)

A. SITTING	B. AFTER EXERCISE	C. 2 MIN. AFTER	D. RECUMBENT	E. AFTER STANDING 3 MIN.
80	120	84	72	96

59. DISTANT VISION
RIGHT 20/20 CORR. TO 20/
LEFT 20/20 CORR. TO 20/

60. REFRACTION
BY S. CX
BY S. CX

61. NEAR VISION
CORR. TO BY
CORR. TO BY

62. HETEROPHORIA (Specify distance)
ES EX R.H. L.H. PRISM DIV. PRISM CONV. CT PC PD
SEE ARTICLE 16-38 (2) (aa) CONCERNING COMPLETION OF ITEMS 57 THRU 72

63. ACCOMMODATION: RIGHT LEFT
64. COLOR VISION (Test used and result)
65. DEPTH PERCEPTION (Test used and score): UNCORRECTED CORRECTED

66. FIELD OF VISION: Normal
67. NIGHT VISION (Test used and score): NE
68. RED LENS TEST: NE
69. INTRAOCULAR TENSION: Normal

70. HEARING
RIGHT WV 15/15 SV /15
LEFT WV 15/15 SV /15

71. AUDIOMETER

	250	500	1000	2000	3000	4000	6000	8000
RIGHT								
LEFT				NE				

72. PSYCHOLOGICAL AND PSYCHOMOTOR (Tests used and score): NE

73. NOTES (Continued) AND SIGNIFICANT OR INTERVAL HISTORY

SEE ARTICLE 16-38(2)(bb)

(Use additional sheets if necessary)

FOR ALL AVIATION PHYSICALS, LEAVE ← 4 INCHES → BLANK SPACE FOR BUMED ENDORSEMENT EXTENDING THROUGH ITEM 74. SEE ARTICLE 16-38(2)(bb)(2) & (cc)(2).

74. SUMMARY OF DEFECTS AND DIAGNOSES (List diagnoses with item numbers)

SEE ARTICLE 16-38(2)(cc)

75. RECOMMENDATIONS—FURTHER SPECIALIST EXAMINATIONS INDICATED (Specify)

SEE ARTICLE 16-38(2)(dd)

76. A. PHYSICAL PROFILE

P	U	L	H	E	S
1	1	1	1	1	1

77. EXAMINEE (Check)
A. ☐ IS QUALIFIED FOR
B. ☐ IS NOT QUALIFIED FOR
SEE ARTICLE 16-38(2)(ff)

B. PHYSICAL CATEGORY
ARTICLE 16-38(2)(ee)

A	B	C	E
X			

78. IF NOT QUALIFIED, LIST DISQUALIFYING DEFECTS BY ITEM NUMBER
SEE ARTICLE 16-38(2)(gg)

79. TYPED OR PRINTED NAME OF PHYSICIAN: C. T. BAIRD, LT MC USN
SIGNATURE: C. T. Baird

80. TYPED OR PRINTED NAME OF PHYSICIAN: R. M. BRIGHTEN, LT MC, USN
SIGNATURE: R M Brighten

81. TYPED OR PRINTED NAME OF DENTIST OR PHYSICIAN (Indicate which)
SIGNATURE

82. TYPED OR PRINTED NAME OF REVIEWING OFFICER OR APPROVING AUTHORITY
SIGNATURE
NUMBER OF ATTACHED SHEETS

SEE ARTICLE 16-38(2)(u)

*U.S. GOVERNMENT PRINTING OFFICE : 1960 O—

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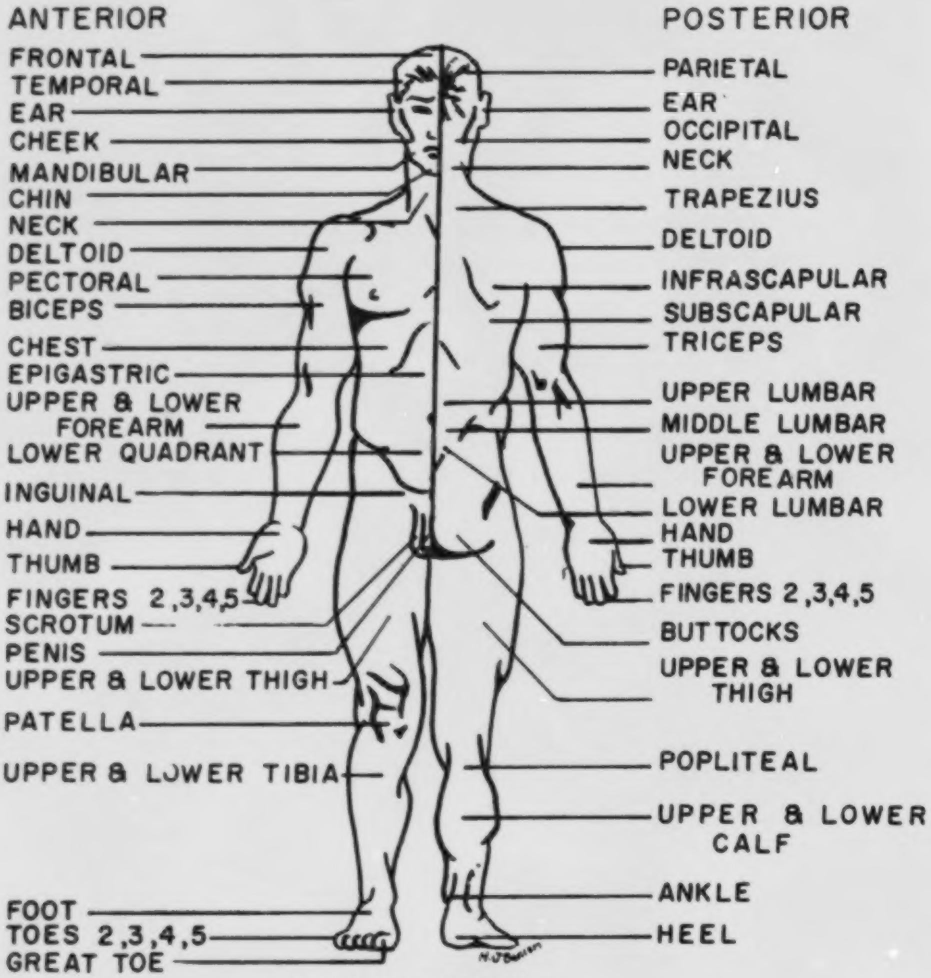
Figure 9-3A.—Report of Medical Examination (Back).


ANTERIOR
FRONTAL
TEMPORAL
EAR
CHEEK
MANDIBULAR
CHIN
NECK
DELTOID
PECTORAL
BICEPS
CHEST
EPIGASTRIC
UPPER & LOWER FOREARM
LOWER QUADRANT
INGUINAL
HAND
THUMB
FINGERS 2,3,4,5
SCROTUM
PENIS
UPPER & LOWER THIGH
PATELLA
UPPER & LOWER TIBIA
FOOT
TOES 2,3,4,5
GREAT TOE
POSTERIOR
PARIETAL
EAR
OCCIPITAL
NECK
TRAPEZIUS
DELTOID
INFRASCAPULAR
SUBSCAPULAR
TRICEPS
UPPER LUMBAR
MIDDLE LUMBAR
UPPER & LOWER FOREARM
LOWER LUMBAR
HAND
THUMB
FINGERS 2,3,4,5
BUTTOCKS
UPPER & LOWER THIGH
POPLITEAL
UPPER & LOWER CALF
ANKLE
HEEL
H.J.Bolton

ABBREVIATIONS

Amputation	amp.	Pinhead mole	p.m.
Circinate	circ.	Raised	r.
Diameter	d.	Right	rt.
Flat	f.	Scar	s.
Fleshy	fl.	Smooth	s.
Left	lt.	Varicocele	var.
Linear	lr	Varicose veins	var.
Mole (or moles)	m.	Vaccination scar	va.
Multiple	mult.	Wart	w
Pitted	p	Hairy	h.

154.65

Figure 9-4.—Marks and Scars Chart.

reserved for the required BUMED endorsement (figs. 9-5 through 9-5C).

ITEM 75 (Recommendations)—Indicate any medical or dental recommendations concerning doubtful conditions found by examination that may require specific evaluation. Specify the particular type of any further special medical or dental examination indicated.

ITEM 77 (Examinee's Qualification)—Regardless of the purpose of the examination, indicate examinee's physical ability to perform active duty at sea, and/or on foreign service, or in the field, as appropriate, and such other information as may be required by current instructions.

ITEM 78 (Disqualifying Defects)—Indicate by item number, most important first.

ITEMS 79-82 (Signatures)—The name, rank, branch of military service, and status of the medical and dental examiner will be typed, printed, or stamped in the left section and signed by the examiner with blue-black or black ink in the right section. Facsimile signature stamps will not be used. When attached sheets are used, each sheet is serially numbered; however, only the actual number of attached sheets will be indicated in the bottom right block of SF 88.

Report of Medical History (SF 93)

The purpose of this form (figs. 9-6 and 9-6A) is to provide a complete personal medical history report and a source of information supplemental to that reported on SF 88. Since the health record is not prepared until the person enters the service, SF 93 provides a current, concise, and comprehensive record of a member's personal medical history prior to entry into the naval service and any subsequent change in his or her status.

The personal information items 1 through 8 of SF 93 will be completed (ink, indelible pencil, or typewritten) in accordance with the instructions applicable to corresponding items of SF 88. Every assistance will be afforded to the examinee so that he or she may fully and clearly understand the terminology appearing in items 9 through 24, thereby enabling him or her to provide a concise and accurate history. Item 25 (Physician's summary) will be prepared and signed by the medical examiner, and in no instance will this item be left blank.

CHRONOLOGICAL RECORD OF MEDICAL CARE (SF 600)

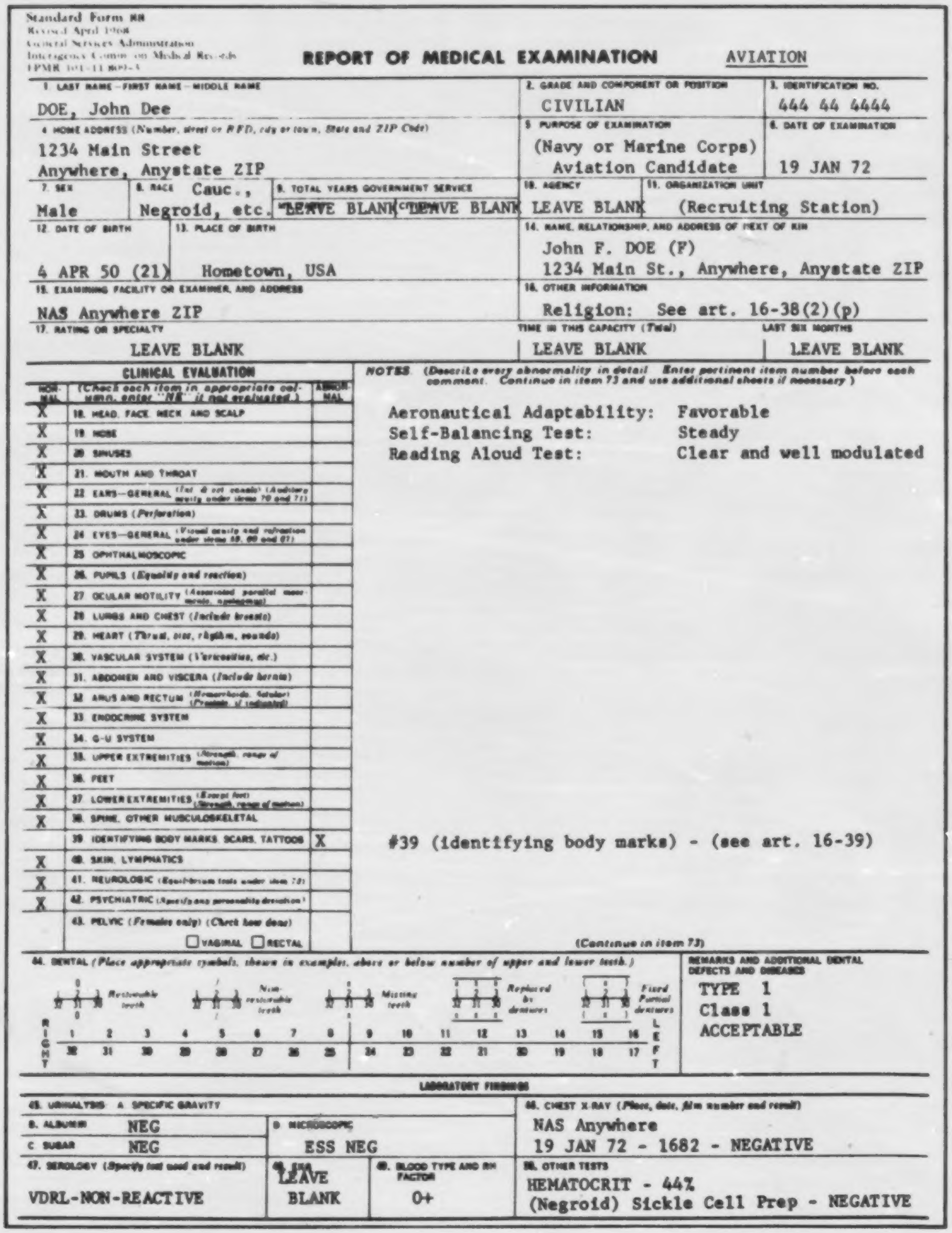
The SF 600 (figs. 9-7 and 9-8) provides a current, concise, and comprehensive record of a member's military medical history. Properly maintained, it facilitates the evaluation of a patient's physical condition, reduces correspondence necessary to obtain medical records, eliminates unnecessary repetition of expensive diagnostic procedures, and serves as an invaluable permanent record of medical evaluations and treatments received.

Entries will be typewritten when practicable (except sick call treatment entries, which may be handwritten in black or blue-black ink). They will include the date, the name and address of the activity responsible for the entry, and the signature of the responsible medical officer or Medical Department representative. Care should be taken to number the pages (front and back) consecutively and to enter the full name, grade or rate, Social Security number, and date of birth of the patient.

The SF 600 is continuous and includes the following information as indicated: complaints, duration of illness or injury, physical findings, clinical course, results of laboratory or other special examinations, treatment (including operations), physical fitness at the time of disposition, and disposition.

Specific SF 600 entries include, but are not limited to the following:

- Sick call treatment entries (fig. 9-7)
- Admission to the sicklist or binnacle list (fig. 9-8)
- Injuries or poisonings (fig. 9-8)



Standard Form 88
Revised April 1968
General Services Administration
Interagency Comm. on Medical Records
FPMR 101-11.806-8

REPORT OF MEDICAL EXAMINATION AVIATION

1. LAST NAME—FIRST NAME—MIDDLE NAME: DOE, John Dee
2. GRADE AND COMPONENT OR POSITION: CIVILIAN
3. IDENTIFICATION NO.: 444 44 4444
4. HOME ADDRESS (Number, street or RFD, city or town, State and ZIP Code): 1234 Main Street
Anywhere, Anystate ZIP
5. PURPOSE OF EXAMINATION: (Navy or Marine Corps) Aviation Candidate
6. DATE OF EXAMINATION: 19 JAN 72
7. SEX: Male
8. RACE: Cauc., Negroid, etc.
9. TOTAL YEARS GOVERNMENT SERVICE: a. MILITARY LEAVE BLANK b. CIVILIAN LEAVE BLANK
10. AGENCY: LEAVE BLANK
11. ORGANIZATION UNIT: (Recruiting Station)
12. DATE OF BIRTH: 4 APR 50 (21)
13. PLACE OF BIRTH: Hometown, USA
14. NAME, RELATIONSHIP, AND ADDRESS OF NEXT OF KIN: John F. DOE (F)
1234 Main St., Anywhere, Anystate ZIP
15. EXAMINING FACILITY OR EXAMINER, AND ADDRESS: NAS Anywhere ZIP
16. OTHER INFORMATION: Religion: See art. 16-38(2)(p)
17. RATING OR SPECIALTY: LEAVE BLANK
TIME IN THIS CAPACITY (Total): LEAVE BLANK
LAST SIX MONTHS: LEAVE BLANK

CLINICAL EVALUATION

NORMAL	(Check each item in appropriate column, enter "NE" if not evaluated.)	ABNORMAL
X	18. HEAD, FACE, NECK AND SCALP	
X	19. NOSE	
X	20. SINUSES	
X	21. MOUTH AND THROAT	
X	22. EARS—GENERAL (Int. & ext. canals) (Auditory acuity under items 70 and 71)	
X	23. DRUMS (Perforation)	
X	24. EYES—GENERAL (Visual acuity and refraction under items 59, 60 and 67)	
X	25. OPHTHALMOSCOPIC	
X	26. PUPILS (Equality and reaction)	
X	27. OCULAR MOTILITY (Associated parallel movements, nystagmus)	
X	28. LUNGS AND CHEST (Include breasts)	
X	29. HEART (Thrust, size, rhythm, sounds)	
X	30. VASCULAR SYSTEM (Varicosities, etc.)	
X	31. ABDOMEN AND VISCERA (Include hernia)	
X	32. ANUS AND RECTUM (Hemorrhoids, fistulae) (Prostate, if indicated)	
X	33. ENDOCRINE SYSTEM	
X	34. G-U SYSTEM	
X	35. UPPER EXTREMITIES (Strength, range of motion)	
X	36. FEET	
X	37. LOWER EXTREMITIES (Except feet) (Strength, range of motion)	
X	38. SPINE, OTHER MUSCULOSKELETAL	
	39. IDENTIFYING BODY MARKS, SCARS, TATTOOS	X
X	40. SKIN, LYMPHATICS	
X	41. NEUROLOGIC (Equilibrium tests under item 72)	
X	42. PSYCHIATRIC (Specify any personality deviation)	
	43. PELVIC (Females only) (Check how done) ☐ VAGINAL ☐ RECTAL	

NOTES (Describe every abnormality in detail. Enter pertinent item number before each comment. Continue in item 73 and use additional sheets if necessary.)

Aeronautical Adaptability: Favorable
Self-Balancing Test: Steady
Reading Aloud Test: Clear and well modulated

#39 (identifying body marks) - (see art. 16-39)

(Continue in item 73)

44. DENTAL (Place appropriate symbols, shown in examples, above or below number of upper and lower teeth.)

Restorable teeth — Non-restorable teeth — Missing teeth — Replaced by dentures — Fixed Partial dentures

RIGHT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	LEFT
	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	

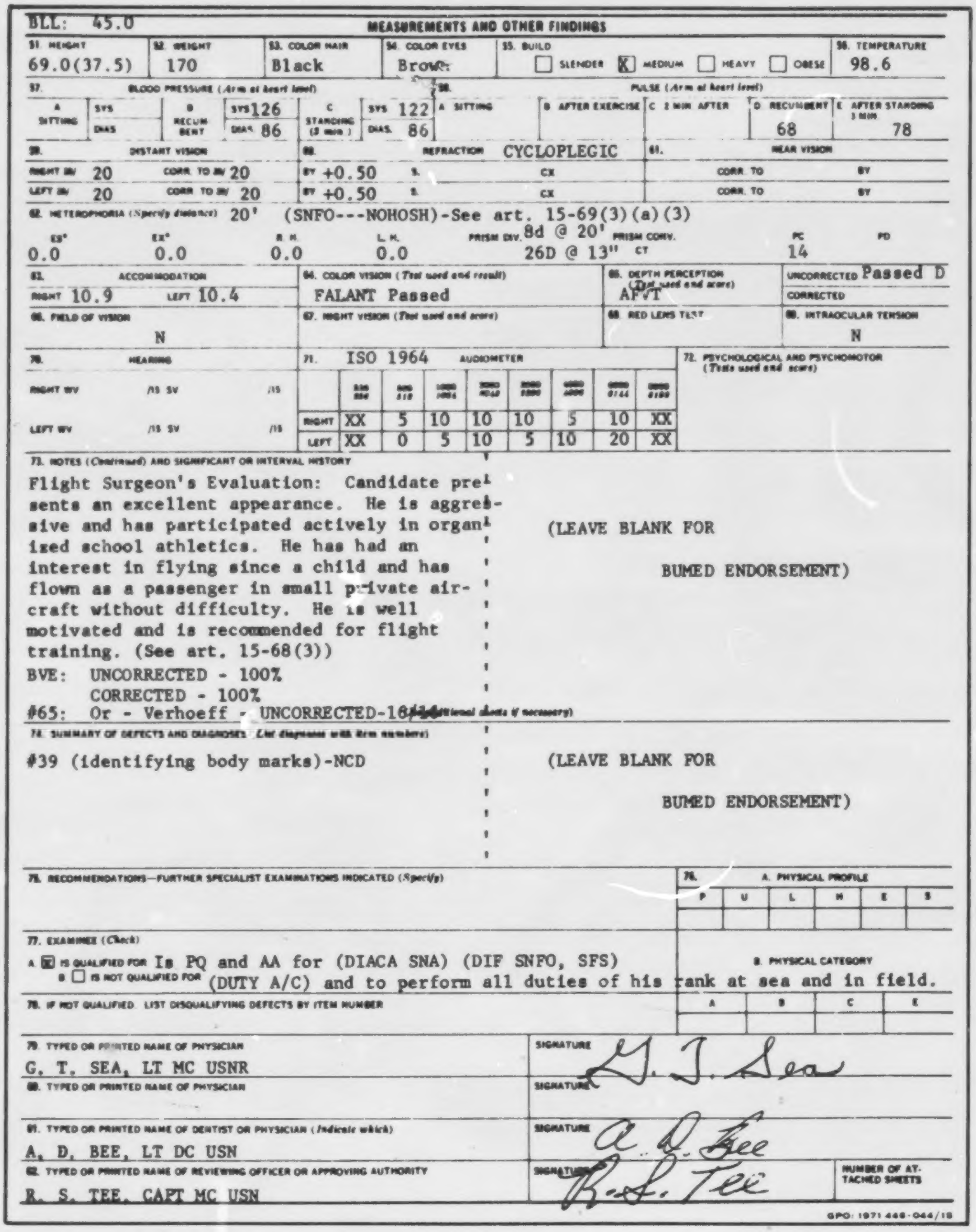
REMARKS AND ADDITIONAL DENTAL DEFECTS AND DISEASES: TYPE 1
Class 1
ACCEPTABLE

LABORATORY FINDINGS

45. URINALYSIS: A. SPECIFIC GRAVITY
B. ALBUMIN: NEG
C. SUGAR: NEG
D. MICROSCOPIC: ESS NEG
46. CHEST X-RAY (Place, date, film number and result): NAS Anywhere
19 JAN 72 - 1682 - NEGATIVE
47. SEROLOGY (Specify test used and result): VDRL-NON-REACTIVE
48. EKG: LEAVE BLANK
49. BLOOD TYPE AND RH FACTOR: 0+
50. OTHER TESTS: HEMATOCRIT - 44%
(Negroid) Sickle Cell Prep - NEGATIVE

154.64

Figure 9-5.—Report of Aviation Candidate Medical Examination (Front).



BLL: 45.0

MEASUREMENTS AND OTHER FINDINGS

51. HEIGHT	52. WEIGHT	53. COLOR HAIR	54. COLOR EYES	55. BUILD	56. TEMPERATURE
69.0(37.5)	170	Black	Brown	☐ SLENDER ☒ MEDIUM ☐ HEAVY ☐ OBESE	98.6

57. BLOOD PRESSURE (Arm at heart level)

A. SITTING	B. RECUMBENT	C. STANDING (3 min.)
SYS	SYS 126	SYS 122
DIAS.	DIAS. 86	DIAS. 86

58. PULSE (Arm at heart level)

A. SITTING	B. AFTER EXERCISE	C. 2 MIN. AFTER	D. RECUMBENT	E. AFTER STANDING 3 MIN.
			68	78

59. DISTANT VISION
RIGHT 20/ 20 CORR. TO 20/ 20
LEFT 20/ 20 CORR. TO 20/ 20

60. REFRACTION CYCLOPLEGIC
BY +0.50 S. CX
BY +0.50 S. CX

61. NEAR VISION
CORR. TO BY
CORR. TO BY

62. HETEROPHORIA (Specify distance) 20' (SNFO---NOHOSH)-See art. 15-69(3)(a)(3)

ES°	EX°	R. H.	L. H.	PRISM DIV.	PRISM CONV.	PC	PD
0.0	0.0	0.0	0.0	8d @ 20'	26D @ 13" CT	14	

63. ACCOMMODATION
RIGHT 10.9 LEFT 10.4

64. COLOR VISION (Test used and result)
FALANT Passed

65. DEPTH PERCEPTION (Test used and score)
AF√T
UNCORRECTED Passed D
CORRECTED

66. FIELD OF VISION
N

67. NIGHT VISION (Test used and score)

68. RED LENS TEST

69. INTRAOCULAR TENSION
N

70. HEARING
RIGHT WV /15 SV /15
LEFT WV /15 SV /15

71. ISO 1964 AUDIOMETER

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
RIGHT	XX	5	10	10	10	5	10	XX
LEFT	XX	0	5	10	5	10	20	XX

72. PSYCHOLOGICAL AND PSYCHOMOTOR (Tests used and score)

73. NOTES (Continued) AND SIGNIFICANT OR INTERVAL HISTORY

Flight Surgeon's Evaluation: Candidate presents an excellent appearance. He is aggressive and has participated actively in organized school athletics. He has had an interest in flying since a child and has flown as a passenger in small private aircraft without difficulty. He is well motivated and is recommended for flight training. (See art. 15-68(3))

BVE: UNCORRECTED - 100%
CORRECTED - 100%
#65: Or - Verhoeff - UNCORRECTED-16[illegible]itional sheets if necessary)

(LEAVE BLANK FOR
BUMED ENDORSEMENT)

74. SUMMARY OF DEFECTS AND DIAGNOSES (List diagnoses with item numbers)

#39 (identifying body marks)-NCD

(LEAVE BLANK FOR
BUMED ENDORSEMENT)

75. RECOMMENDATIONS—FURTHER SPECIALIST EXAMINATIONS INDICATED (Specify)

76. A. PHYSICAL PROFILE

P	U	L	H	E	S

77. EXAMINEE (Check)
A. ☒ IS QUALIFIED FOR Is PQ and AA for (DIACA SNA) (DIF SNFO, SFS)
B. ☐ IS NOT QUALIFIED FOR (DUTY A/C) and to perform all duties of his rank at sea and in field.

B. PHYSICAL CATEGORY

A	B	C	E

78. IF NOT QUALIFIED, LIST DISQUALIFYING DEFECTS BY ITEM NUMBER

79. TYPED OR PRINTED NAME OF PHYSICIAN
G. T. SEA, LT MC USNR
SIGNATURE G. T. Sea

80. TYPED OR PRINTED NAME OF PHYSICIAN
SIGNATURE

81. TYPED OR PRINTED NAME OF DENTIST OR PHYSICIAN (Indicate which)
A. D. BEE, LT DC USN
SIGNATURE A. D. Bee

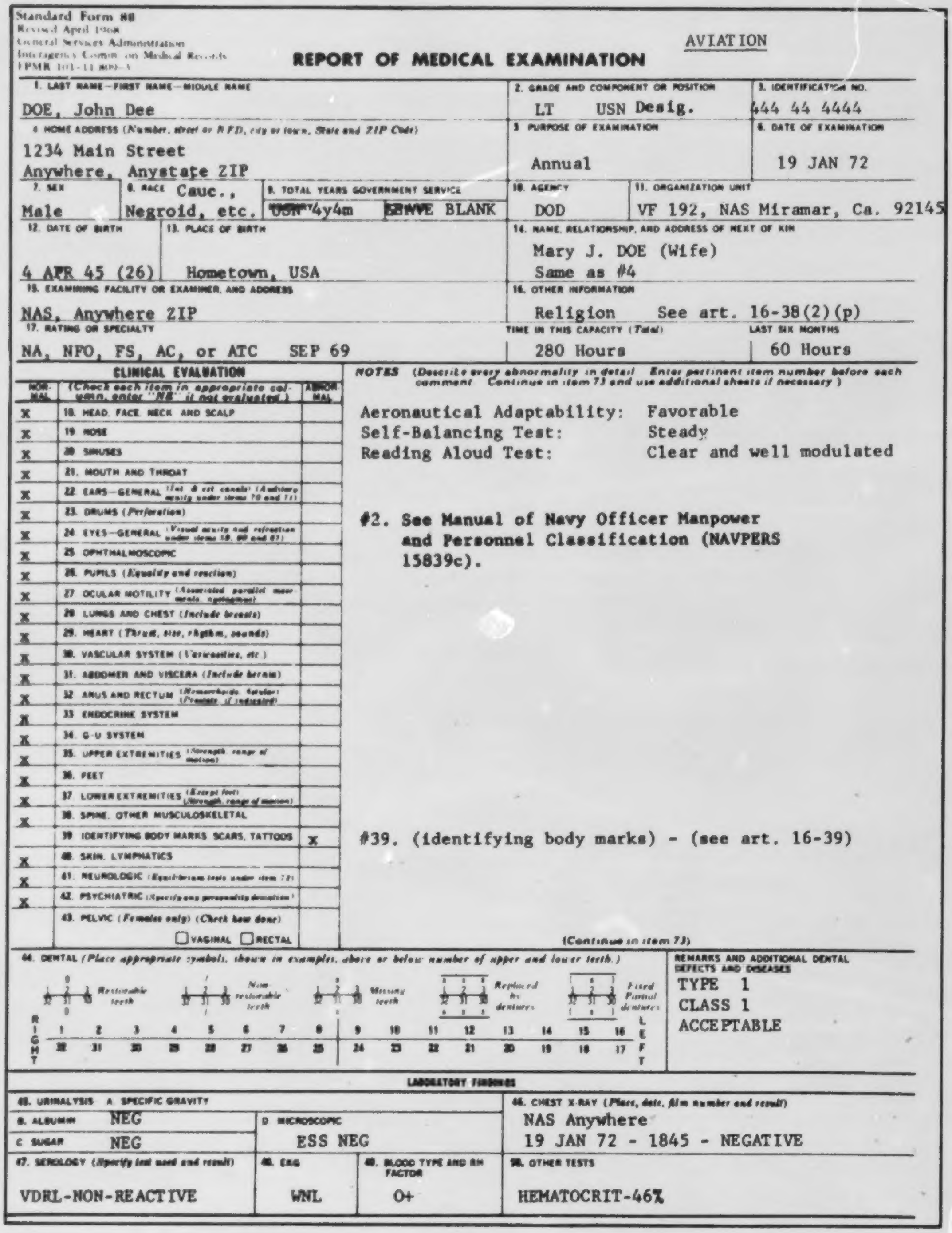
82. TYPED OR PRINTED NAME OF REVIEWING OFFICER OR APPROVING AUTHORITY
R. S. TEE, CAPT MC USN
SIGNATURE R. S. Tee

NUMBER OF ATTACHED SHEETS

GPO: 1971 446-044/18

154.64

Figure 9-5A.—Report of Aviation Candidate Medical Examination (Back).



Standard Form 88
Revised April 1968
General Services Administration
Interagency Comm. on Medical Records
FPMR 101-11.806-8

AVIATION

REPORT OF MEDICAL EXAMINATION

1. LAST NAME—FIRST NAME—MIDDLE NAME: DOE, John Dee
2. GRADE AND COMPONENT OR POSITION: LT USN Desig.
3. IDENTIFICATION NO.: 444 44 4444
4. HOME ADDRESS (Number, street or RFD, city or town, State and ZIP Code): 1234 Main Street, Anywhere, Anystate ZIP
5. PURPOSE OF EXAMINATION: Annual
6. DATE OF EXAMINATION: 19 JAN 72
7. SEX: Male
8. RACE: Cauc., Negroid, etc.
9. TOTAL YEARS GOVERNMENT SERVICE: ~~USN~~ 4y4m ~~LEAVE~~ BLANK
10. AGENCY: DOD
11. ORGANIZATION UNIT: VF 192, NAS Miramar, Ca. 92145
12. DATE OF BIRTH: 4 APR 45 (26)
13. PLACE OF BIRTH: Hometown, USA
14. NAME, RELATIONSHIP, AND ADDRESS OF NEXT OF KIN: Mary J. DOE (Wife) Same as #4
15. EXAMINING FACILITY OR EXAMINER, AND ADDRESS: NAS, Anywhere ZIP
16. OTHER INFORMATION: Religion See art. 16-38(2)(p)
17. RATING OR SPECIALTY: NA, NFO, FS, AC, or ATC SEP 69
TIME IN THIS CAPACITY (Total): 280 Hours
LAST SIX MONTHS: 60 Hours

CLINICAL EVALUATION

NORMAL	(Check each item in appropriate column, enter "NE" if not evaluated.)	ABNORMAL
X	18. HEAD, FACE, NECK AND SCALP	
X	19. NOSE	
X	20. SINUSES	
X	21. MOUTH AND THROAT	
X	22. EARS—GENERAL (Int. & ext. canals) (Auditory acuity under items 70 and 71)	
X	23. DRUMS (Perforation)	
X	24. EYES—GENERAL (Visual acuity and refraction under items 59, 60 and 67)	
X	25. OPHTHALMOSCOPIC	
X	26. PUPILS (Equality and reaction)	
X	27. OCULAR MOTILITY (Associated parallel movements, nystagmus)	
X	28. LUNGS AND CHEST (Include breasts)	
X	29. HEART (Thrust, size, rhythm, sounds)	
X	30. VASCULAR SYSTEM (Varicosities, etc.)	
X	31. ABDOMEN AND VISCERA (Include hernia)	
X	32. ANUS AND RECTUM (Hemorrhoids, fistulae) (Prostate, if indicated)	
X	33. ENDOCRINE SYSTEM	
X	34. G-U SYSTEM	
X	35. UPPER EXTREMITIES (Strength, range of motion)	
X	36. FEET	
X	37. LOWER EXTREMITIES (Except feet) (Strength, range of motion)	
X	38. SPINE, OTHER MUSCULOSKELETAL	
	39. IDENTIFYING BODY MARKS, SCARS, TATTOOS	X
X	40. SKIN, LYMPHATICS	
X	41. NEUROLOGIC (Equilibrium tests under item 72)	
X	42. PSYCHIATRIC (Specify any personality deviation)	
	43. PELVIC (Females only) (Check how done) ☐ VAGINAL ☐ RECTAL	

NOTES (Describe every abnormality in detail. Enter pertinent item number before each comment. Continue in item 73 and use additional sheets if necessary.)

Aeronautical Adaptability: Favorable
Self-Balancing Test: Steady
Reading Aloud Test: Clear and well modulated

#2. See Manual of Navy Officer Manpower and Personnel Classification (NAVPERS 15839c).

#39. (identifying body marks) - (see art. 16-39)

(Continue in item 73)

44. DENTAL (Place appropriate symbols, shown in examples, above or below number of upper and lower teeth.)

Restorable teeth
Non-restorable teeth
Missing teeth
Replaced by dentures
Fixed Partial dentures

RIGHT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	LEFT
	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	

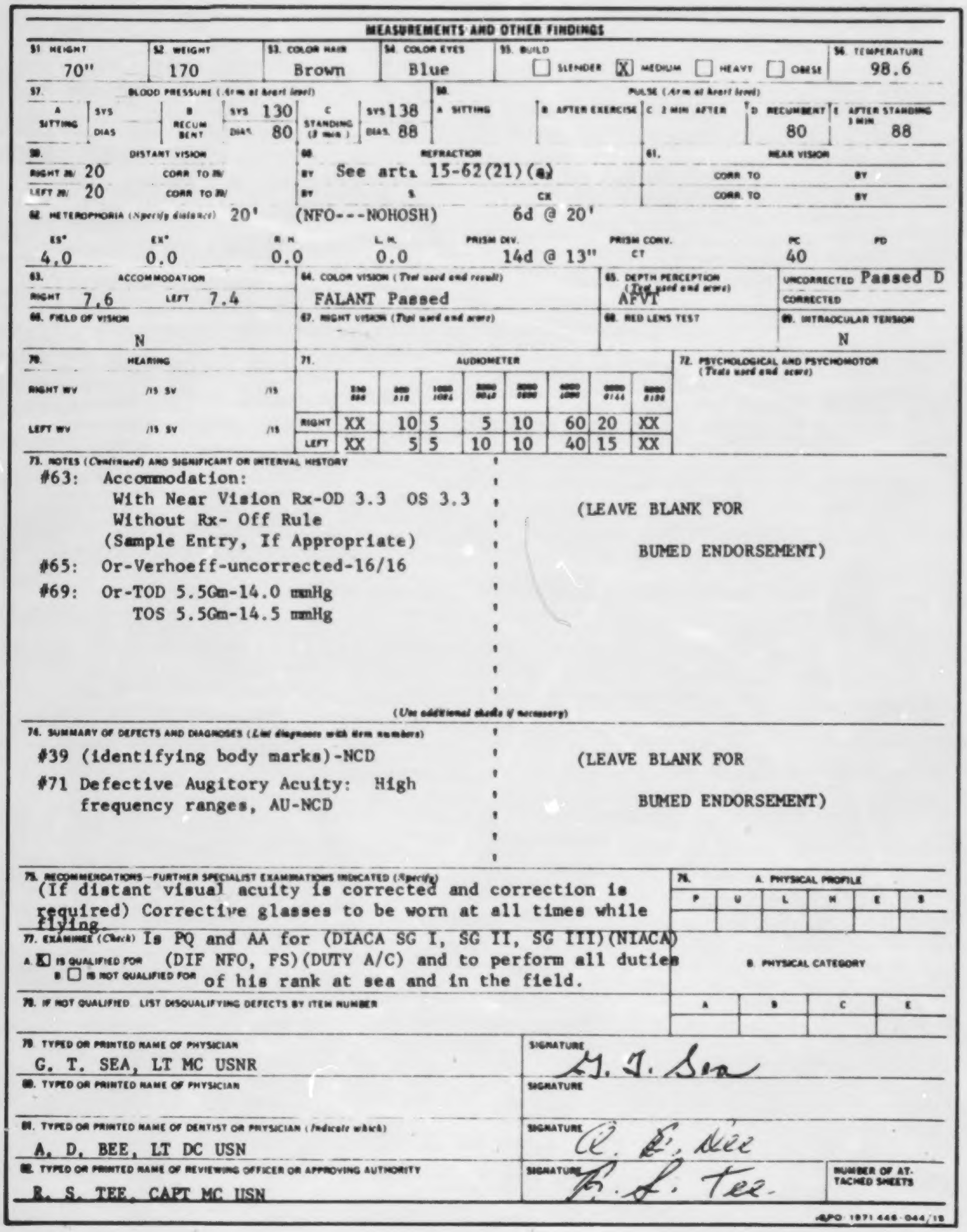
REMARKS AND ADDITIONAL DENTAL DEFECTS AND DISEASES
TYPE 1
CLASS 1
ACCEPTABLE

LABORATORY FINDINGS

45. URINALYSIS A. SPECIFIC GRAVITY
B. ALBUMIN NEG
C. SUGAR NEG
D. MICROSCOPIC ESS NEG
46. CHEST X-RAY (Place, date, film number and result): NAS Anywhere 19 JAN 72 - 1845 - NEGATIVE
47. SEROLOGY (Specify test used and result): VDRL-NON-REACTIVE
48. EKG: WNL
49. BLOOD TYPE AND RH FACTOR: O+
50. OTHER TESTS: HEMATOCRIT-46%

154.64

Figure 9-5B.—Report of Aviation Annual Medical Examination (Front).



MEASUREMENTS AND OTHER FINDINGS

51. HEIGHT 70"
52. WEIGHT 170
53. COLOR HAIR Brown
54. COLOR EYES Blue
55. BUILD ☐ SLENDER ☒ MEDIUM ☐ HEAVY ☐ OBESE
56. TEMPERATURE 98.6

57. BLOOD PRESSURE (Arm at heart level)
A. SITTING SYS DIAS
B. RECUMBENT SYS 130 DIAS. 80
C. STANDING (3 min.) SYS 138 DIAS. 88

58. PULSE (Arm at heart level)
A. SITTING
B. AFTER EXERCISE
C. 2 MIN AFTER
D. RECUMBENT 80
E. AFTER STANDING 3 MIN 88

59. DISTANT VISION
RIGHT 20/ 20 CORR. TO 20/
LEFT 20/ 20 CORR. TO 20/

60. REFRACTION
BY See art. 15-62(21)(a)
BY S. CX

61. NEAR VISION
CORR. TO BY
CORR. TO BY

62. HETEROPHORIA (Specify distance) 20' (NFO---NOHOSH) 6d @ 20'

ES°	EX°	R. H.	L. H.	PRISM DIV.	PRISM CONV.	PC	PD
4.0	0.0	0.0	0.0	14d @ 13"	CT	40	

63. ACCOMMODATION RIGHT 7.6 LEFT 7.4
64. COLOR VISION (Test used and result) FALANT Passed
65. DEPTH PERCEPTION (Test used and score) AFVT UNCORRECTED Passed D CORRECTED
66. FIELD OF VISION N
67. NIGHT VISION (Test used and score)
68. RED LENS TEST
69. INTRAOCULAR TENSION N

70. HEARING
RIGHT WV /15 SV /15
LEFT WV /15 SV /15

71. AUDIOMETER

	250 256	500 512	1000 1024	2000 2048	3000 2896	4000 4096	6000 6144	8000 8192
RIGHT	XX	10	5	5	10	60	20	XX
LEFT	XX	5	5	10	10	40	15	XX

72. PSYCHOLOGICAL AND PSYCHOMOTOR (Tests used and score)

73. NOTES (Continued) AND SIGNIFICANT OR INTERVAL HISTORY

#63: Accommodation:
With Near Vision Rx-OD 3.3 OS 3.3
Without Rx- Off Rule
(Sample Entry, If Appropriate)
#65: Or-Verhoeff-uncorrected-16/16
#69: Or-TOD 5.5Gm-14.0 mmHg
TOS 5.5Gm-14.5 mmHg

(LEAVE BLANK FOR
BUMED ENDORSEMENT)

(Use additional sheets if necessary)

74. SUMMARY OF DEFECTS AND DIAGNOSES (List diagnoses with item numbers)

#39 (identifying body marks)-NCD
#71 Defective Augitory Acuity: High frequency ranges, AU-NCD

(LEAVE BLANK FOR
BUMED ENDORSEMENT)

75. RECOMMENDATIONS—FURTHER SPECIALIST EXAMINATIONS INDICATED (Specify)
(If distant visual acuity is corrected and correction is required) Corrective glasses to be worn at all times while flying.

76. A. PHYSICAL PROFILE

P	U	L	H	E	S

77. EXAMINEE (Check) Is PQ and AA for (DIACA SG I, SG II, SG III)(NIACA)
A. ☒ IS QUALIFIED FOR (DIF NFO, FS)(DUTY A/C) and to perform all duties
B. ☐ IS NOT QUALIFIED FOR of his rank at sea and in the field.

B. PHYSICAL CATEGORY

A	B	C	E

78. IF NOT QUALIFIED, LIST DISQUALIFYING DEFECTS BY ITEM NUMBER

79. TYPED OR PRINTED NAME OF PHYSICIAN G. T. SEA, LT MC USNR
SIGNATURE G. T. Sea

80. TYPED OR PRINTED NAME OF PHYSICIAN
SIGNATURE

81. TYPED OR PRINTED NAME OF DENTIST OR PHYSICIAN (Indicate which) A. D. BEE, LT DC USN
SIGNATURE A. D. Bee

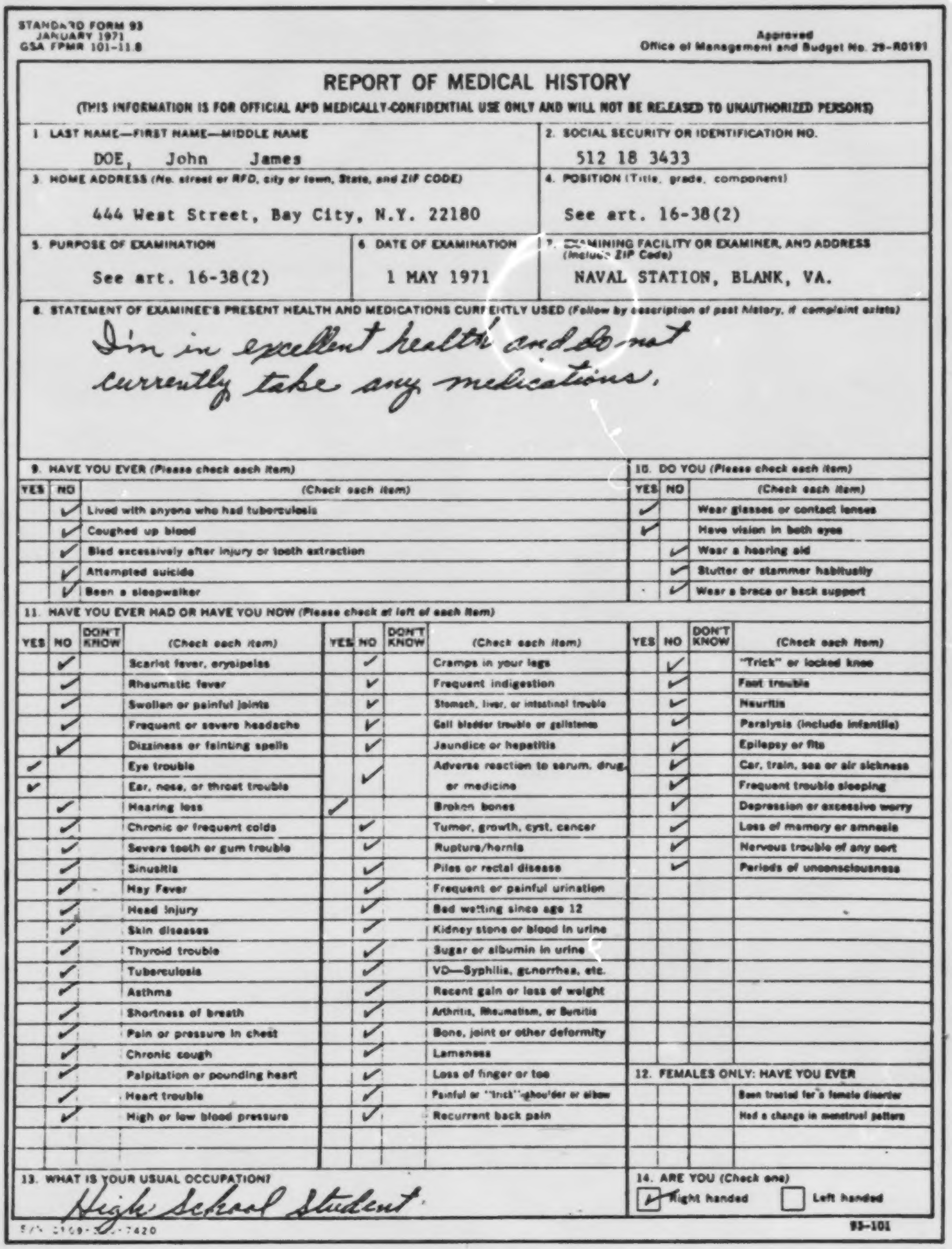
82. TYPED OR PRINTED NAME OF REVIEWING OFFICER OR APPROVING AUTHORITY R. S. TEE, CAPT MC USN
SIGNATURE R. S. Tee

NUMBER OF ATTACHED SHEETS

GPO 1971 446-044/15

154.64

Figure 9-5C.—Report of Aviation Annual Medical Examination (Back).



STANDARD FORM 93
JANUARY 1971
GSA FPMR 101-11.8

Approved
Office of Management and Budget No. 29-R0191

REPORT OF MEDICAL HISTORY

(THIS INFORMATION IS FOR OFFICIAL AND MEDICALLY-CONFIDENTIAL USE ONLY AND WILL NOT BE RELEASED TO UNAUTHORIZED PERSONS)

1. LAST NAME—FIRST NAME—MIDDLE NAME: DOE, John James
2. SOCIAL SECURITY OR IDENTIFICATION NO.: 512 18 3433
3. HOME ADDRESS (No. street or RFD, city or town, State, and ZIP CODE): 444 West Street, Bay City, N.Y. 22180
4. POSITION (Title, grade, component): See art. 16-38(2)
5. PURPOSE OF EXAMINATION: See art. 16-38(2)
6. DATE OF EXAMINATION: 1 MAY 1971
7. EXAMINING FACILITY OR EXAMINER, AND ADDRESS (Include ZIP Code): NAVAL STATION, BLANK, VA.

8. STATEMENT OF EXAMINEE'S PRESENT HEALTH AND MEDICATIONS CURRENTLY USED (Follow by description of past history, if complaint exists)

I'm in excellent health and do not currently take any medications.

9. HAVE YOU EVER (Please check each item)			10. DO YOU (Please check each item)		
YES	NO	(Check each item)	YES	NO	(Check each item)
	✓	Lived with anyone who had tuberculosis	✓		Wear glasses or contact lenses
	✓	Coughed up blood	✓		Have vision in both eyes
	✓	Bled excessively after injury or tooth extraction		✓	Wear a hearing aid
	✓	Attempted suicide		✓	Stutter or stammer habitually
	✓	Been a sleepwalker		✓	Wear a brace or back support

11. HAVE YOU EVER HAD OR HAVE YOU NOW (Please check at left of each item)

YES	NO	DON'T KNOW	(Check each item)	YES	NO	DON'T KNOW	(Check each item)	YES	NO	DON'T KNOW	(Check each item)
	✓		Scarlet fever, erysipelas		✓		Cramps in your legs		✓		"Trick" or locked knee
	✓		Rheumatic fever		✓		Frequent indigestion		✓		Foot trouble
	✓		Swollen or painful joints		✓		Stomach, liver, or intestinal trouble		✓		Neuritis
	✓		Frequent or severe headache		✓		Gall bladder trouble or gallstones		✓		Paralysis (include infantile)
	✓		Dizziness or fainting spells		✓		Jaundice or hepatitis		✓		Epilepsy or fits
✓			Eye trouble		✓		Adverse reaction to serum, drug, or medicine		✓		Car, train, sea or air sickness
✓			Ear, nose, or throat trouble						✓		Frequent trouble sleeping
	✓		Hearing loss	✓			Broken bones		✓		Depression or excessive worry
	✓		Chronic or frequent colds		✓		Tumor, growth, cyst, cancer		✓		Loss of memory or amnesia
	✓		Severe tooth or gum trouble		✓		Rupture/hernia		✓		Nervous trouble of any sort
	✓		Sinusitis		✓		Piles or rectal disease		✓		Periods of unconsciousness
	✓		Hay Fever		✓		Frequent or painful urination				
	✓		Head injury		✓		Bed wetting since age 12				
	✓		Skin diseases		✓		Kidney stone or blood in urine				
	✓		Thyroid trouble		✓		Sugar or albumin in urine				
	✓		Tuberculosis		✓		VD—Syphilis, gonorrhea, etc.				
	✓		Asthma		✓		Recent gain or loss of weight				
	✓		Shortness of breath		✓		Arthritis, Rheumatism, or Bursitis				
	✓		Pain or pressure in chest		✓		Bone, joint or other deformity				
	✓		Chronic cough		✓		Lameness				
	✓		Palpitation or pounding heart		✓		Loss of finger or toe	12. FEMALES ONLY: HAVE YOU EVER			
	✓		Heart trouble		✓		Painful or "trick" shoulder or elbow				Been treated for a female disorder
	✓		High or low blood pressure		✓		Recurrent back pain				Had a change in menstrual pattern

13. WHAT IS YOUR USUAL OCCUPATION? High School Student

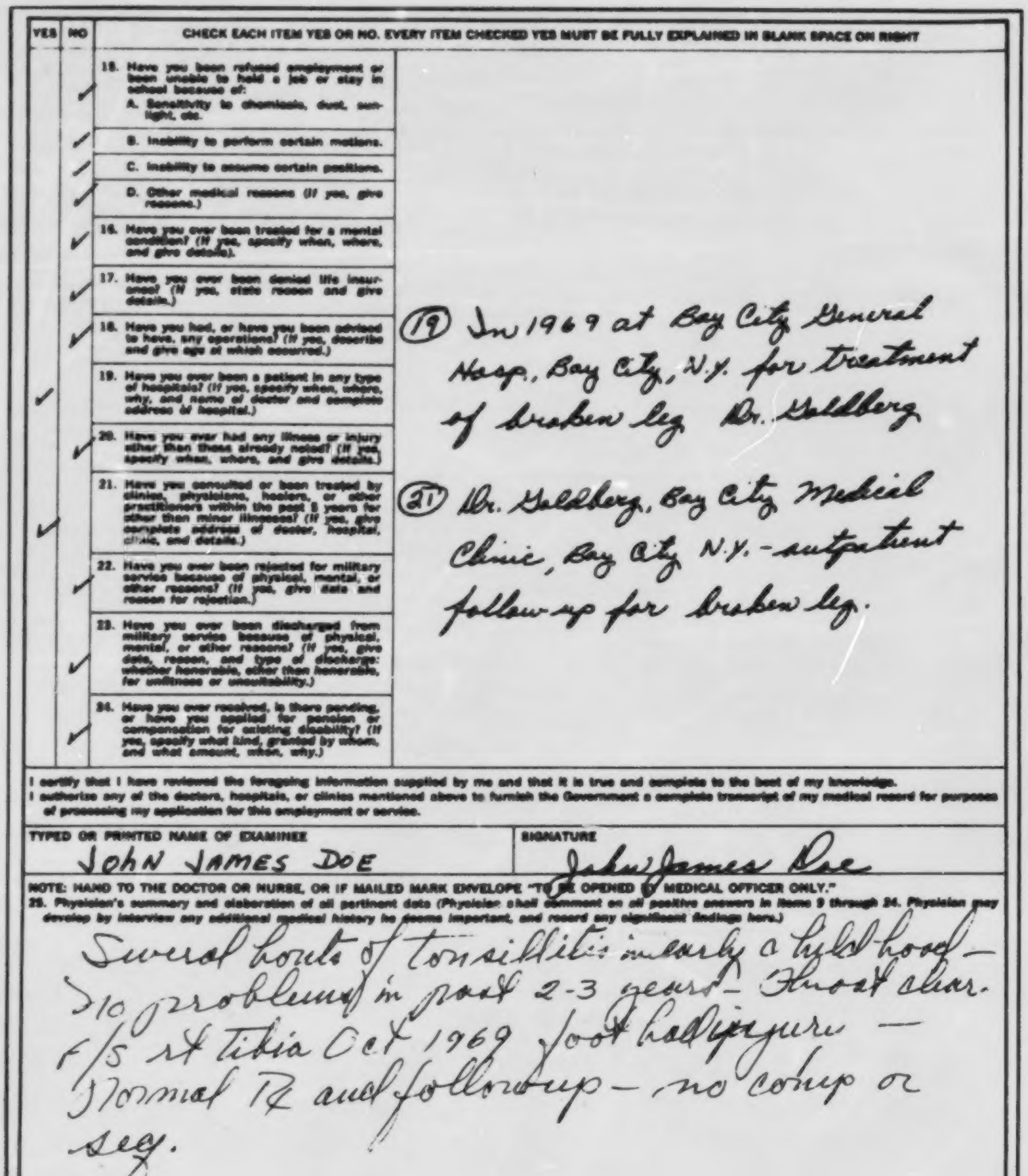
14. ARE YOU (Check one) ☑ Right handed ☐ Left handed

S/N 0109-[illegible]-7420

93-101

154.66

Figure 9-6.—Report of Medical History (Front).



YES	NO	CHECK EACH ITEM YES OR NO. EVERY ITEM CHECKED YES MUST BE FULLY EXPLAINED IN BLANK SPACE ON RIGHT
	✓	15. Have you been refused employment or been unable to hold a job or stay in school because of: A. Sensitivity to chemicals, dust, sunlight, etc.
	✓	B. Inability to perform certain motions.
	✓	C. Inability to assume certain positions.
	✓	D. Other medical reasons (If yes, give reasons.)
	✓	16. Have you ever been treated for a mental condition? (If yes, specify when, where, and give details).
	✓	17. Have you ever been denied life insurance? (If yes, state reason and give details.)
	✓	18. Have you had, or have you been advised to have, any operations? (If yes, describe and give age at which occurred.)
✓		19. Have you ever been a patient in any type of hospitals? (If yes, specify when, where, why, and name of doctor and complete address of hospital.)
	✓	20. Have you ever had any illness or injury other than those already noted? (If yes, specify when, where, and give details.)
✓		21. Have you consulted or been treated by clinics, physicians, healers, or other practitioners within the past 5 years for other than minor illnesses? (If yes, give complete address of doctor, hospital, clinic, and details.)
	✓	22. Have you ever been rejected for military service because of physical, mental, or other reasons? (If yes, give date and reason for rejection.)
	✓	23. Have you ever been discharged from military service because of physical, mental, or other reasons? (If yes, give date, reason, and type of discharge: whether honorable, other than honorable, for unfitness or unsuitability.)
	✓	24. Have you ever received, is there pending, or have you applied for pension or compensation for existing disability? (If yes, specify what kind, granted by whom, and what amount, when, why.)

(19) In 1969 at Bay City General Hosp., Bay City, N.Y. for treatment of broken leg Dr. Goldberg

(21) Dr. Goldberg, Bay City Medical Clinic, Bay City N.Y. - outpatient follow-up for broken leg.

I certify that I have reviewed the foregoing information supplied by me and that it is true and complete to the best of my knowledge.
I authorize any of the doctors, hospitals, or clinics mentioned above to furnish the Government a complete transcript of my medical record for purposes of processing my application for this employment or service.

TYPED OR PRINTED NAME OF EXAMINEE JOHN JAMES DOE	SIGNATURE John James Doe

NOTE: HAND TO THE DOCTOR OR NURSE, OR IF MAILED MARK ENVELOPE "TO BE OPENED BY MEDICAL OFFICER ONLY."

25. Physician's summary and elaboration of all pertinent data (Physician shall comment on all positive answers in items 9 through 24. Physician may develop by interview any additional medical history he deems important, and record any significant findings here.)

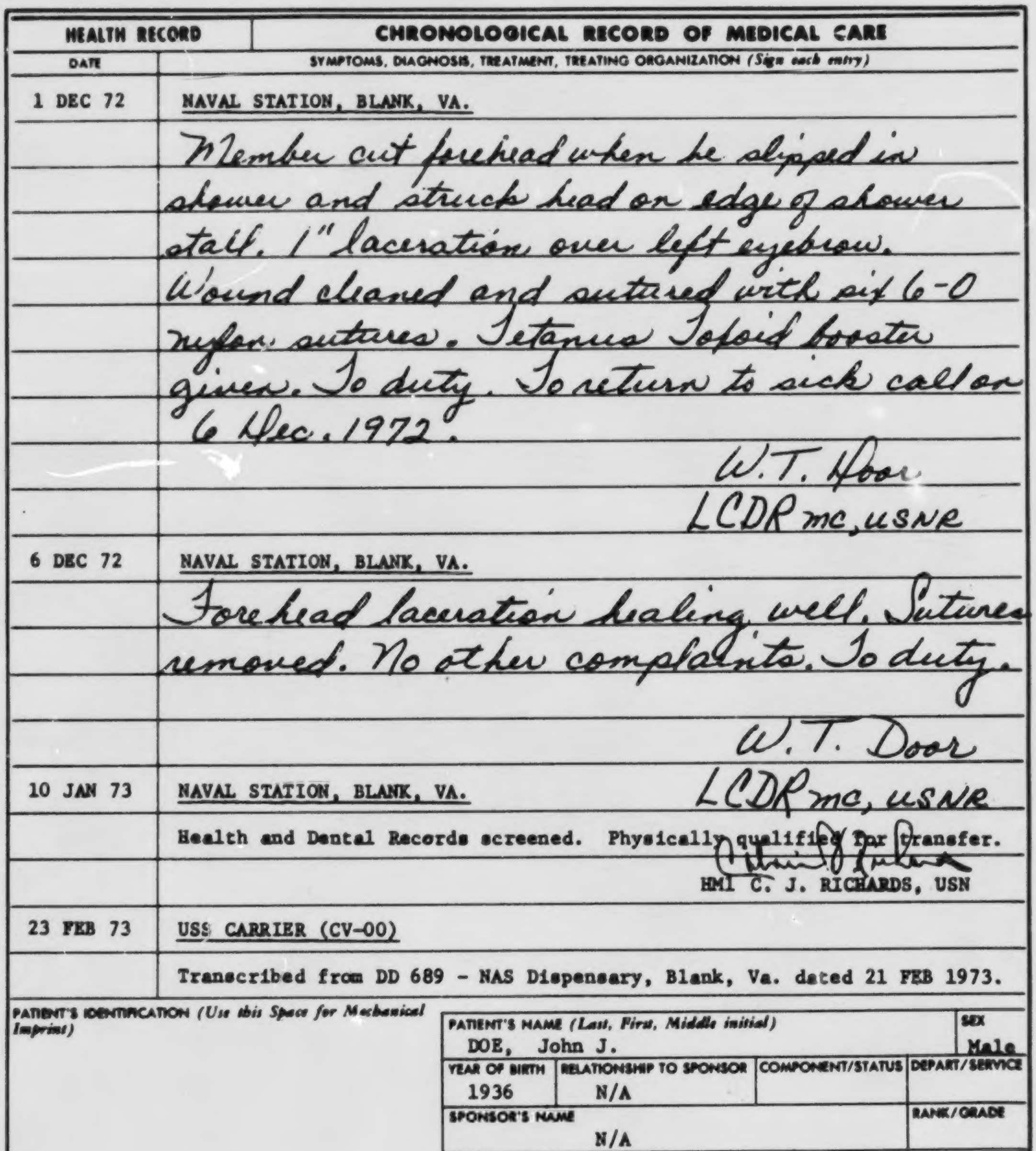
Several bouts of tonsillitis in early childhood — No problems in past 2-3 years — Throat clear. F/S rt tibia Oct 1969 football injury — Normal Rx and followup — no comp or seq.

TYPED OR PRINTED NAME OF PHYSICIAN OR EXAMINER WILLIAM R. STACK LT. MC USN	DATE 5-1-71	SIGNATURE William R. Stack	NUMBER OF ATTACHED SHEETS 0

REVERSE OF STANDARD FORM 93

154.66

Figure 9-6A.—Report of Medical History (Back).



HEALTH RECORD	CHRONOLOGICAL RECORD OF MEDICAL CARE
DATE	SYMPTOMS, DIAGNOSIS, TREATMENT, TREATING ORGANIZATION *(Sign each entry)*
1 DEC 72	NAVAL STATION, BLANK, VA.
	Member cut forehead when he slipped in shower and struck head on edge of shower stall. 1" laceration over left eyebrow. Wound cleaned and sutured with six 6-0 nylon sutures. Tetanus Toxoid booster given. To duty. To return to sick call on 6 Dec. 1972.
	W.T. Door LCDR MC, USNR
6 DEC 72	NAVAL STATION, BLANK, VA.
	Forehead laceration healing well. Sutures removed. No other complaints. To duty.
	W.T. Door LCDR MC, USNR
10 JAN 73	NAVAL STATION, BLANK, VA.
	Health and Dental Records screened. Physically qualified for transfer.
	HM1 C. J. RICHARDS, USN
23 FEB 73	USS CARRIER (CV-00)
	Transcribed from DD 689 - NAS Dispensary, Blank, Va. dated 21 FEB 1973.

PATIENT'S IDENTIFICATION *(Use this Space for Mechanical Imprint)*

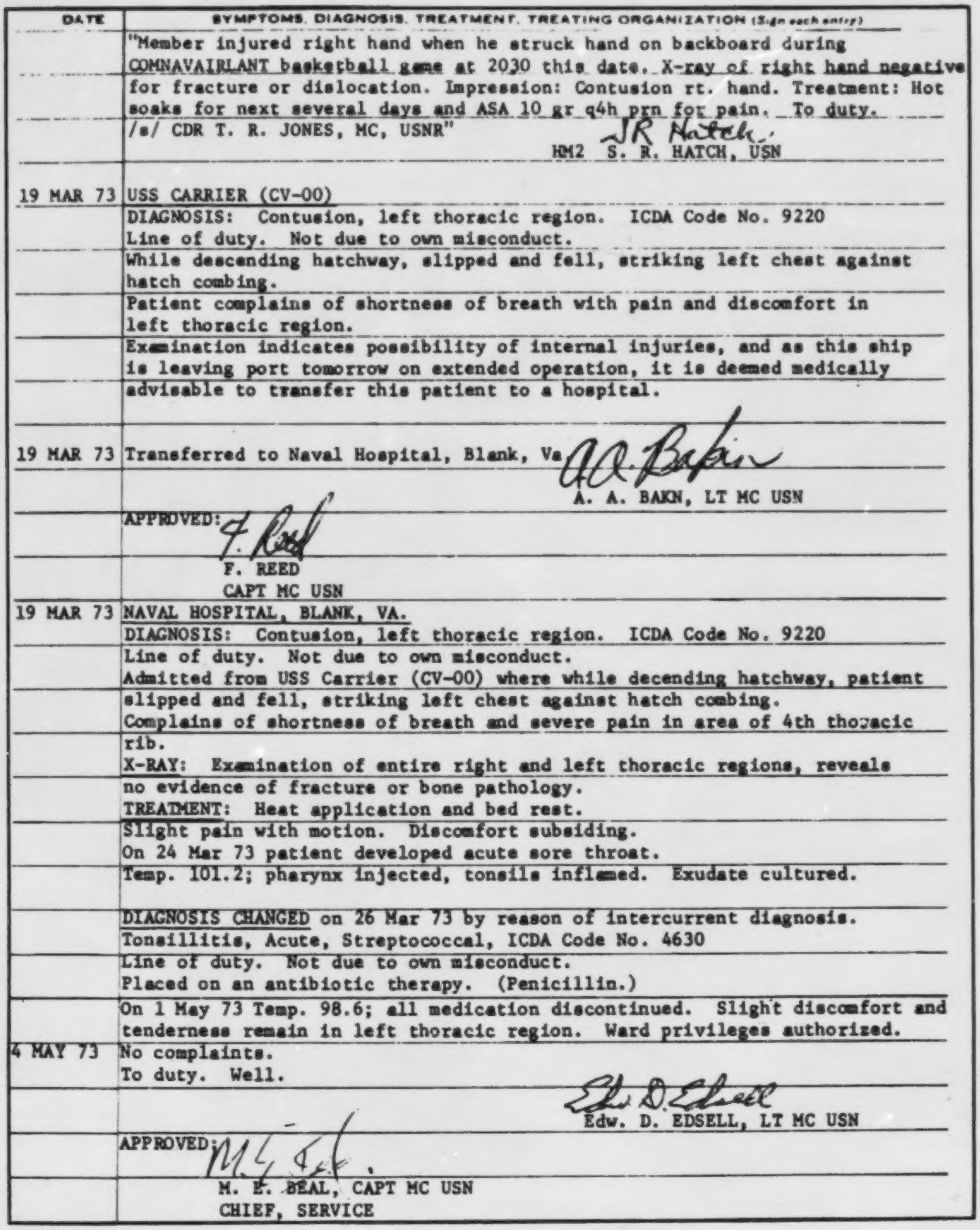
PATIENT'S NAME *(Last, First, Middle initial)*: DOE, John J.	SEX: Male
YEAR OF BIRTH: 1936	RELATIONSHIP TO SPONSOR: N/A
COMPONENT/STATUS:	DEPART/SERVICE:
SPONSOR'S NAME: N/A	RANK/GRADE:
SSAN OR IDENTIFICATION NO.: SSN: 000 00 0000	ORGANIZATION:

CHRONOLOGICAL RECORD OF MEDICAL CARE

Standard Form 600
September 1971
General Services Administration and
Interagency Comm. on Medical Records
FPMR 101-11.809-3

154.67

Figure 9-7.—Chronological Record of Medical Care (Front).



DATE	SYMPTOMS, DIAGNOSIS, TREATMENT, TREATING ORGANIZATION *(Sign each entry)*
	"Member injured right hand when he struck hand on backboard during COMNAVAIRLANT basketball game at 2030 this date. X-ray of right hand negative for fracture or dislocation. Impression: Contusion rt. hand. Treatment: Hot soaks for next several days and ASA 10 gr q4h prn for pain. To duty.
	/s/ CDR T. R. JONES, MC, USNR"
	JR Hatch HM2 S. R. HATCH, USN
19 MAR 73	USS CARRIER (CV-00)
	DIAGNOSIS: Contusion, left thoracic region. ICDA Code No. 9220
	Line of duty. Not due to own misconduct.
	While descending hatchway, slipped and fell, striking left chest against hatch combing.
	Patient complains of shortness of breath with pain and discomfort in left thoracic region.
	Examination indicates possibility of internal injuries, and as this ship is leaving port tomorrow on extended operation, it is deemed medically advisable to transfer this patient to a hospital.
19 MAR 73	Transferred to Naval Hospital, Blank, Va. AA Bakn
	A. A. BAKN, LT MC USN
	APPROVED: F. Reed
	F. REED CAPT MC USN
19 MAR 73	NAVAL HOSPITAL, BLANK, VA.
	DIAGNOSIS: Contusion, left thoracic region. ICDA Code No. 9220
	Line of duty. Not due to own misconduct.
	Admitted from USS Carrier (CV-00) where while decending hatchway, patient slipped and fell, striking left chest against hatch combing.
	Complains of shortness of breath and severe pain in area of 4th thoracic rib.
	X-RAY: Examination of entire right and left thoracic regions, reveals no evidence of fracture or bone pathology.
	TREATMENT: Heat application and bed rest.
	Slight pain with motion. Discomfort subsiding.
	On 24 Mar 73 patient developed acute sore throat.
	Temp. 101.2; pharynx injected, tonsils inflamed. Exudate cultured.
	DIAGNOSIS CHANGED on 26 Mar 73 by reason of intercurrent diagnosis.
	Tonsillitis, Acute, Streptococcal, ICDA Code No. 4630
	Line of duty. Not due to own misconduct.
	Placed on an antibiotic therapy. (Penicillin.)
	On 1 May 73 Temp. 98.6; all medication discontinued. Slight discomfort and tenderness remain in left thoracic region. Ward privileges authorized.
4 MAY 73	No complaints.
	To duty. Well.
	Edw D Edsell Edw. D. EDSELL, LT MC USN
	APPROVED:
	M. E. BEAL, CAPT MC USN CHIEF, SERVICE

154.67

Figure 9-8.—Chronological Record of Medical Care (Back).

- Physical examination entries (fig. 9-7) (if a copy of the applicable SF 88 is not inserted in the health record):
    - Title of the examining facility
    - Date and purpose of the examination
    - Weight and blood pressure
    - Urinalysis results
    - Results of any blood work performed (serology, etc.)
    - ECG results
    - Chest X-ray number and results
    - Defects noted
    - Name and signature of the medical examiner
- Disease or injury occurring away from the command (fig. 9-8)
- Correction/erroneous entries (fig. 9-2)
- Special 600 (hypersensitivities, etc.) (fig. 9-9)
- Blood Grouping and Typing Record, Special SF 600 (fig. 9-10), which should be maintained on top of the regular SF 600's
- Transfer of X-rays

Whenever a member is evaluated at sick call, an entry will be made on SF 600, reflecting the complaints or conditions presented, pertinent history, treatment rendered, and disposition.

Each admission for injury or poisoning is recorded in accordance with BUMEDINST 6300.3 and 6300.4 (Inpatient Data System) and the *International Classification of Diseases, Adapted, (ICDA) VOL. 1.*

The entry concerning each admission, to final disposition, will be complete with regard to time, date, place, circumstances, diagnosis for which treated, and the signature of the medical officer or Medical Department representative.

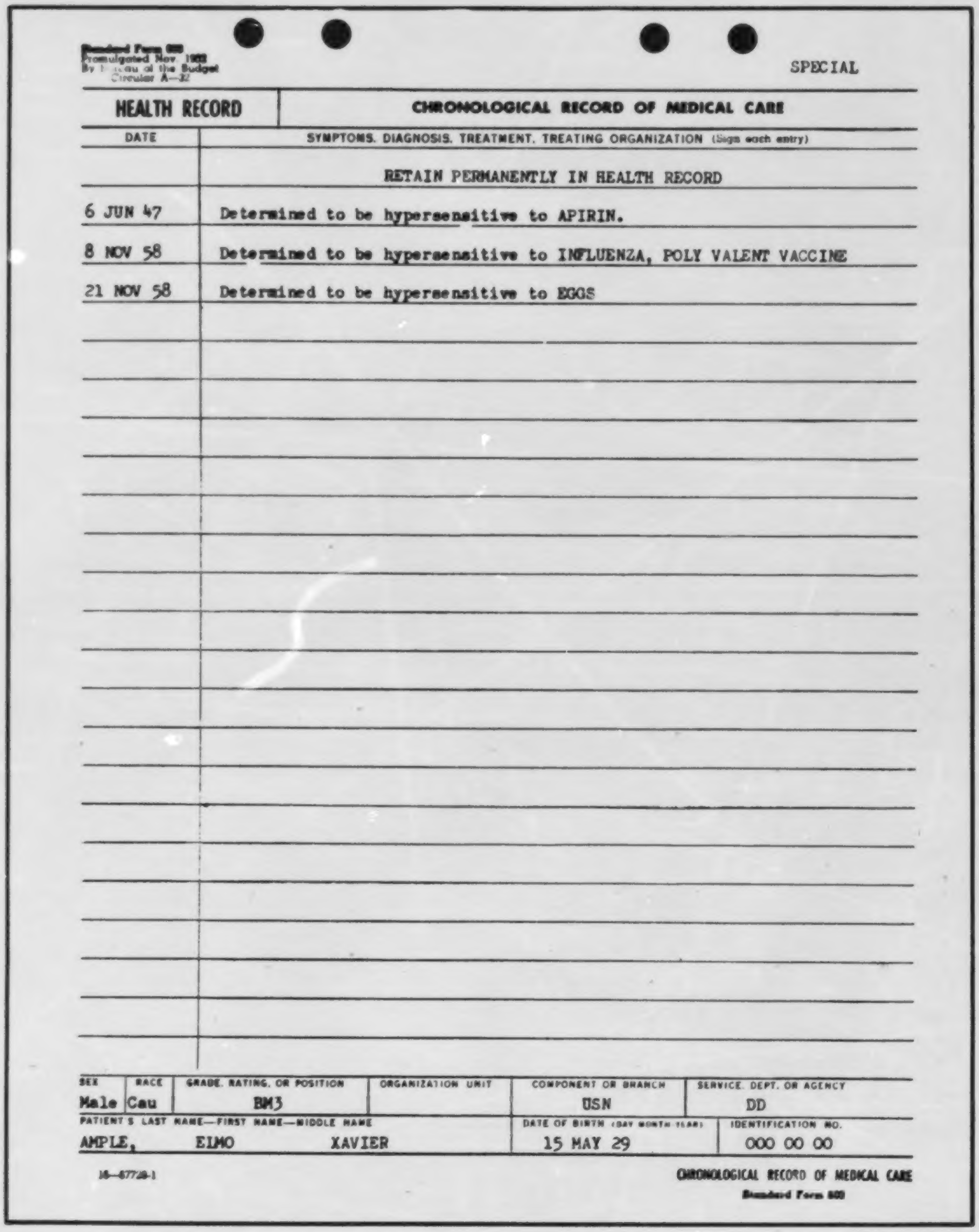
When a member of the naval service incurs an injury that might result in permanent disability or that results in his or her physical inability to perform duty for a period exceeding 24 hours, an entry will be made concerning line of duty and misconduct. Such an entry will include specific facts concerning time, date, place, names of persons involved, and circumstances surrounding the injury.

Upon admission of an active duty member to the sicklist, the medical officer or Medical Department representive will enter whether the disease or injury occurred in the line of duty, and was or was not the result of the patient's own misconduct. (See NAVREGS, articles 1111 and 1112.)

Miscellaneous Entries:

- Dental treatment will be recorded when the patient is on the sicklist and when treatment is related to the condition for which the patient was admitted. These entries will be made and signed by the dental officer. Notes concerning conditions of unusual interest and of medical or dental significance may be made when appropriate.
- When a prescription for spectacles is entered on the SF 600, the frame measurements also are entered in detail. This can be accomplished by transcribing the data from the prescription to the SF 600 or securely attaching the prescription form to the SF 600 with transparent tape.
- When a patient is transferred and radiographs are transferred with him or her, a notation to that effect will be entered on the SF 600 or SF 502, as appropriate.
- Each time a photofluorographic examination of the chest is made, the place, date, film number, and report of the interpretation

350



Standard Form 600
Promulgated Nov 1953
By Bureau of the Budget
Circular A-32

SPECIAL

HEALTH RECORD | **CHRONOLOGICAL RECORD OF MEDICAL CARE**

DATE	SYMPTOMS, DIAGNOSIS, TREATMENT, TREATING ORGANIZATION (Sign each entry)
	RETAIN PERMANENTLY IN HEALTH RECORD
6 JUN 47	Determined to be hypersensitive to APIRIN.
8 NOV 58	Determined to be hypersensitive to INFLUENZA, POLY VALENT VACCINE
21 NOV 58	Determined to be hypersensitive to EGGS

SEX	RACE	GRADE, RATING, OR POSITION	ORGANIZATION UNIT	COMPONENT OR BRANCH	SERVICE, DEPT, OR AGENCY
Male	Cau	BM3		USN	DD

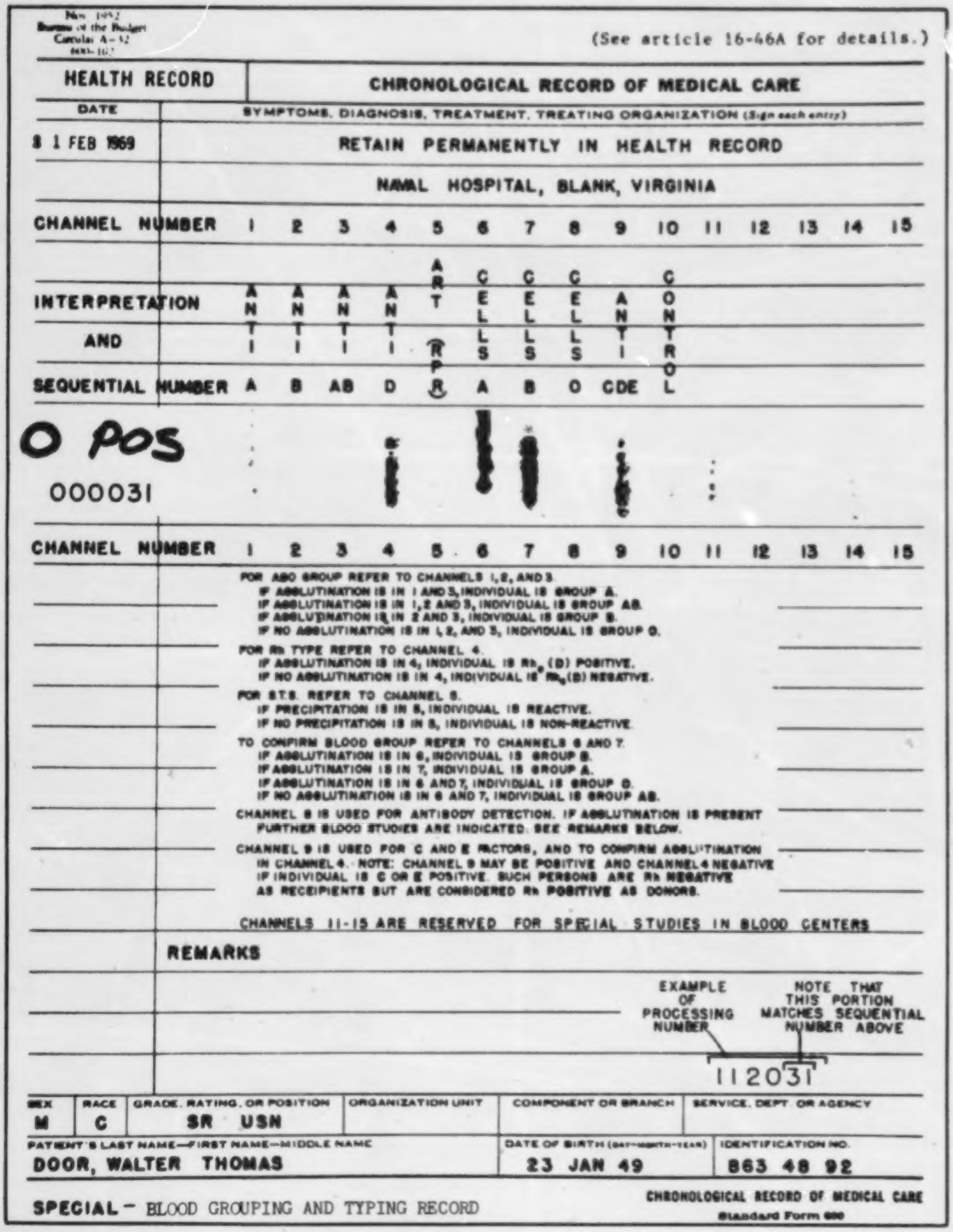
PATIENT'S LAST NAME—FIRST NAME—MIDDLE NAME	DATE OF BIRTH (DAY MONTH YEAR)	IDENTIFICATION NO.
AMPLE, ELMO XAVIER	15 MAY 29	000 00 00

16—67720-1

CHRONOLOGICAL RECORD OF MEDICAL CARE
Standard Form 600

154.67

Figure 9-9.—Chronological Record of Medical Care—Special.



Nov. 1952
Bureau of the Budget
Circular A-32
600-102

(See article 16-46A for details.)

HEALTH RECORD	**CHRONOLOGICAL RECORD OF MEDICAL CARE**
DATE	SYMPTOMS, DIAGNOSIS, TREATMENT, TREATING ORGANIZATION (Sign each entry)
8 1 FEB 1969	RETAIN PERMANENTLY IN HEALTH RECORD
	NAVAL HOSPITAL, BLANK, VIRGINIA

CHANNEL NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
INTERPRETATION AND SEQUENTIAL NUMBER	ANTI A	ANTI B	ANTI AB	ANTI D	ART RPR	CELLS A	CELLS B	CELLS O	ANTI CDE	CONTROL					

0 POS

000031

CHANNEL NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

FOR ABO GROUP REFER TO CHANNELS 1, 2, AND 3.
IF AGGLUTINATION IS IN 1 AND 3, INDIVIDUAL IS GROUP A.
IF AGGLUTINATION IS IN 1, 2 AND 3, INDIVIDUAL IS GROUP AB.
IF AGGLUTINATION IS IN 2 AND 3, INDIVIDUAL IS GROUP B.
IF NO AGGLUTINATION IS IN 1, 2, AND 3, INDIVIDUAL IS GROUP O.

FOR Rh TYPE REFER TO CHANNEL 4.
IF AGGLUTINATION IS IN 4, INDIVIDUAL IS Rh_o (D) POSITIVE.
IF NO AGGLUTINATION IS IN 4, INDIVIDUAL IS Rh_o (D) NEGATIVE.

FOR S.T.S. REFER TO CHANNEL 5.
IF PRECIPITATION IS IN 5, INDIVIDUAL IS REACTIVE.
IF NO PRECIPITATION IS IN 5, INDIVIDUAL IS NON-REACTIVE.

TO CONFIRM BLOOD GROUP REFER TO CHANNELS 6 AND 7.
IF AGGLUTINATION IS IN 6, INDIVIDUAL IS GROUP B.
IF AGGLUTINATION IS IN 7, INDIVIDUAL IS GROUP A.
IF AGGLUTINATION IS IN 6 AND 7, INDIVIDUAL IS GROUP O.
IF NO AGGLUTINATION IS IN 6 AND 7, INDIVIDUAL IS GROUP AB.

CHANNEL 8 IS USED FOR ANTIBODY DETECTION. IF AGGLUTINATION IS PRESENT FURTHER BLOOD STUDIES ARE INDICATED. SEE REMARKS BELOW.

CHANNEL 9 IS USED FOR C AND E FACTORS, AND TO CONFIRM AGGLUTINATION IN CHANNEL 4. NOTE: CHANNEL 9 MAY BE POSITIVE AND CHANNEL 4 NEGATIVE IF INDIVIDUAL IS C OR E POSITIVE. SUCH PERSONS ARE Rh NEGATIVE AS RECEIPIENTS BUT ARE CONSIDERED Rh POSITIVE AS DONORS.

CHANNELS 11-15 ARE RESERVED FOR SPECIAL STUDIES IN BLOOD CENTERS

REMARKS

EXAMPLE OF PROCESSING NUMBER

NOTE THAT THIS PORTION MATCHES SEQUENTIAL NUMBER ABOVE

112031

SEX	RACE	GRADE, RATING, OR POSITION	ORGANIZATION UNIT	COMPONENT OR BRANCH	SERVICE, DEPT. OR AGENCY
M	C	SR USN			

PATIENT'S LAST NAME—FIRST NAME—MIDDLE NAME	DATE OF BIRTH (DAY-MONTH-YEAR)	IDENTIFICATION NO.
DOOR, WALTER THOMAS	23 JAN 49	863 48 92

SPECIAL – BLOOD GROUPING AND TYPING RECORD

CHRONOLOGICAL RECORD OF MEDICAL CARE
Standard Form 600

154.67

Figure 9-10.—Blood Grouping and Typing Record.

will be entered on the SF 600 or SF 88 if the purpose of the examination requires the preparation of an SF 88. Entries are not required on both the SF 600 and the SF 88 for the same examination.

- Results of laboratory examinations made on personnel exposed to radiological hazards will be entered on the SF 600, listing any abnormalities and action taken.

- Any hypersensitivity to drugs or chemicals known to exist are indicated on a separate SF 600. The page no. will be marked "SPECIAL" in the center of the page at the top and bottom. This SF 600 (fig. 9-9) will be the first medical page on the right side of the health record following NAVPERS 5510/1, Record Identifier for Personnel Reliability. Appropriate entries regarding hypersensitivity should be made on this page. Hypersensitivity to a local anesthetic or other substance will also be recorded on SF 603 and DD 722-1.

- When an individual is assigned to duty involving exposure to high intensity noise, a reference audiogram will be conducted and the results recorded on SF 600. This entry will be labeled "Reference Audiogram" and will be retained permanently in the health record.

- When a member of the naval service is injured or contracts a disease while on leave, or when for any reason the facts concerning an injury or sickness have not been entered in the individual's health record, the medical officer or Medical Department representative having custody of the record ascertains the facts in the case and makes the necessary entries.

- Recording injuries and poisonings. Circumstances of occurrence are reported as two numbered items for active duty military personnel. The first item will show duty status, i.e., on duty/off duty, at the time of the accident. The second item is a concise, factual statement that conveys why, where, how, and when the accident occurred.

IMMUNIZATION RECORD (SF 601)

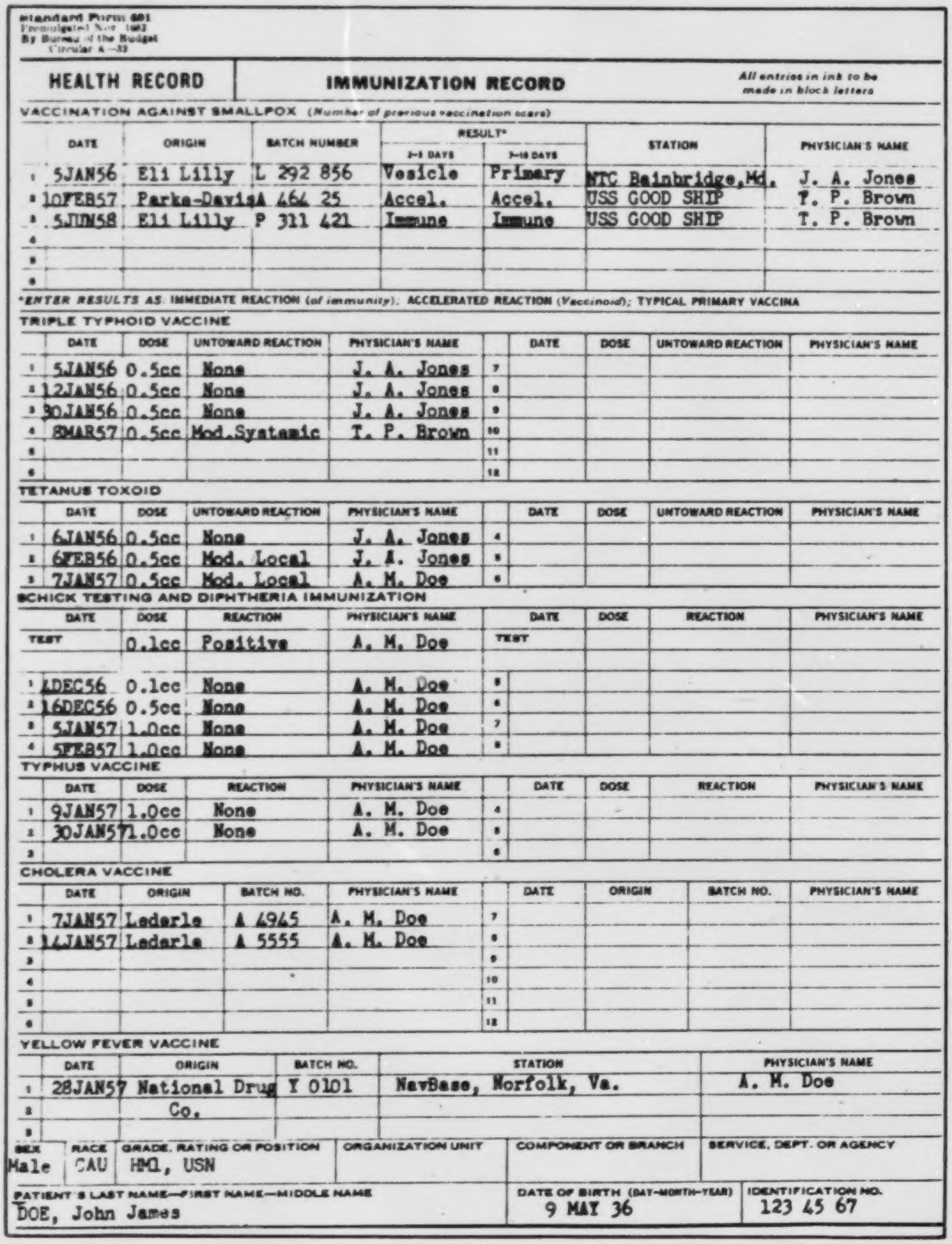
The purpose of this form (figs. 9-11/11A) is to record information that pertains to prophylactic immunizations; sensitivity tests; reactions to transfusions, drugs, sera, food, and allergens; and blood typing. The recordings will be continued on the current record until additional space is required under any single category. In such cases a new SF 601 will be inserted and retained with the old SF 601s. Concurrently, a thorough verification of the entries will be made and all immunizations brought up to date. Replacement of the current SF 601 is not required because of a change in grade, rating, or status of the member. When the health record is closed, all SF 601s are forwarded together with other parts of the health record.

The name of the medical officer or Medical Department representative administering the immunization or test or determining the nature of the sensitivity reaction will be typed or stamped on the form. Signatures are not required; however, in the event of their use, care should be taken to ensure their legibility.

The medical officer or Medical Department representative administering the immunization is responsible for completing all entries in the appropriate sections of SF 601. For specific immunizing agents for smallpox, cholera, and yellow fever, the manufacturer's name and batch or lot number must be recorded.

Information concerning a determined hypersensitivity to a drug or chemical is indicated under "Remarks and Recommendations." Appropriate entries (such as HYPERSENSITIVE TO ASPIRIN, HYPERSENSITIVE TO LIDOCAINE) will be typed in capitals. This is in addition to a similar entry required on the SF 603 and SF 600 retained permanently in the health record (fig. 9-9). When recording positive results (10 mm or more induration) of the tuberculin skin test (PPD), refer to BUMEDINST 6224.1 series for current procedures for administering the Tuberculosis Control Program.

All personnel performing international travel under the cognizance of the Department of the Navy will be immunized in accordance with BUMEDINST 6230 series and the current edition of NAVMED P-5052-15 and have in their possession a properly completed and authenticated PHS Form 731, International Certificate of Immunization.



Standard Form 601
Promulgated Nov. 1952
By Bureau of the Budget
Circular A—33

HEALTH RECORD | **IMMUNIZATION RECORD** | *All entries in ink to be made in block letters*

VACCINATION AGAINST SMALLPOX (*Number of previous vaccination scars*)

	DATE	ORIGIN	BATCH NUMBER	RESULT*		STATION	PHYSICIAN'S NAME
				1-3 DAYS	7-10 DAYS		
1	5JAN56	Eli Lilly	L 292 856	Vesicle	Primary	NTC Bainbridge, Md.	J. A. Jones
2	10FEB57	Parke-Davis	A 464 25	Accel.	Accel.	USS GOOD SHIP	T. P. Brown
3	5JUN58	Eli Lilly	P 311 421	Immune	Immune	USS GOOD SHIP	T. P. Brown
4							
5							
6							

*ENTER RESULTS AS: IMMEDIATE REACTION (*of immunity*); ACCELERATED REACTION (*Vaccinoid*); TYPICAL PRIMARY VACCINA

TRIPLE TYPHOID VACCINE

	DATE	DOSE	UNTOWARD REACTION	PHYSICIAN'S NAME		DATE	DOSE	UNTOWARD REACTION	PHYSICIAN'S NAME
1	5JAN56	0.5cc	None	J. A. Jones	7				
2	12JAN56	0.5cc	None	J. A. Jones	8				
3	30JAN56	0.5cc	None	J. A. Jones	9				
4	8MAR57	0.5cc	Mod. Systemic	T. P. Brown	10				
5					11				
6					12				

TETANUS TOXOID

	DATE	DOSE	UNTOWARD REACTION	PHYSICIAN'S NAME		DATE	DOSE	UNTOWARD REACTION	PHYSICIAN'S NAME
1	6JAN56	0.5cc	None	J. A. Jones	4				
2	6FEB56	0.5cc	Mod. Local	J. A. Jones	5				
3	7JAN57	0.5cc	Mod. Local	A. M. Doe	6				

SCHICK TESTING AND DIPHTHERIA IMMUNIZATION

	DATE	DOSE	REACTION	PHYSICIAN'S NAME		DATE	DOSE	REACTION	PHYSICIAN'S NAME
TEST		0.1cc	Positive	A. M. Doe	TEST				
1	4DEC56	0.1cc	None	A. M. Doe	5				
2	16DEC56	0.5cc	None	A. M. Doe	6				
3	5JAN57	1.0cc	None	A. M. Doe	7				
4	5FEB57	1.0cc	None	A. M. Doe	8				

TYPHUS VACCINE

	DATE	DOSE	REACTION	PHYSICIAN'S NAME		DATE	DOSE	REACTION	PHYSICIAN'S NAME
1	9JAN57	1.0cc	None	A. M. Doe	4				
2	30JAN57	1.0cc	None	A. M. Doe	5				
3					6				

CHOLERA VACCINE

	DATE	ORIGIN	BATCH NO.	PHYSICIAN'S NAME		DATE	ORIGIN	BATCH NO.	PHYSICIAN'S NAME
1	7JAN57	Lederle	A 4945	A. M. Doe	7				
2	14JAN57	Lederle	A 5555	A. M. Doe	8				
3					9				
4					10				
5					11				
6					12				

YELLOW FEVER VACCINE

	DATE	ORIGIN	BATCH NO.	STATION	PHYSICIAN'S NAME
1	28JAN57	National Drug	Y 0101	NavBase, Norfolk, Va.	A. M. Doe
2		Co.			
3					

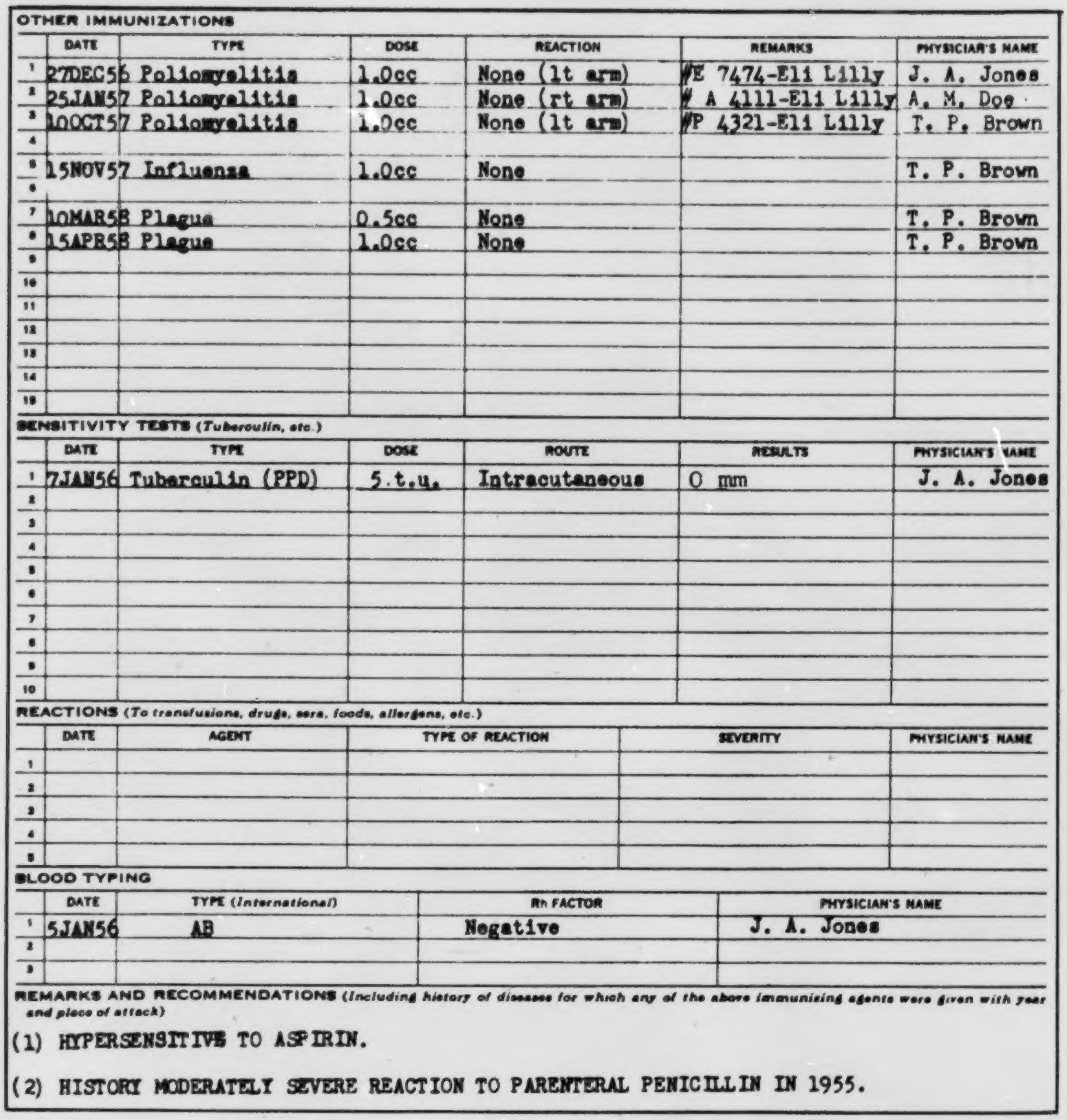
SEX	RACE	GRADE, RATING OR POSITION	ORGANIZATION UNIT	COMPONENT OR BRANCH	SERVICE, DEPT. OR AGENCY
Male	CAU	HM1, USN			

PATIENT'S LAST NAME—FIRST NAME—MIDDLE NAME	DATE OF BIRTH (DAY-MONTH-YEAR)	IDENTIFICATION NO.
DOE, John James	9 MAY 36	123 45 67

154.68

Figure 9-11.—Immunization Record (Front).

354



OTHER IMMUNIZATIONS

	DATE	TYPE	DOSE	REACTION	REMARKS	PHYSICIAN'S NAME
1	27DEC56	Poliomyelitis	1.0cc	None (lt arm)	#E 7474-Eli Lilly	J. A. Jones
2	25JAN57	Poliomyelitis	1.0cc	None (rt arm)	# A 4111-Eli Lilly	A. M. Doe
3	10OCT57	Poliomyelitis	1.0cc	None (lt arm)	#P 4321-Eli Lilly	T. P. Brown
4						
5	15NOV57	Influenza	1.0cc	None		T. P. Brown
6						
7	10MAR58	Plague	0.5cc	None		T. P. Brown
8	15APR58	Plague	1.0cc	None		T. P. Brown
9						
10						
11						
12						
13						
14						
15						

SENSITIVITY TESTS *(Tuberculin, etc.)*

	DATE	TYPE	DOSE	ROUTE	RESULTS	PHYSICIAN'S NAME
1	7JAN56	Tuberculin (PPD)	5.t.u.	Intracutaneous	0 mm	J. A. Jones
2						
3						
4						
5						
6						
7						
8						
9						
10						

REACTIONS *(To transfusions, drugs, sera, foods, allergens, etc.)*

	DATE	AGENT	TYPE OF REACTION	SEVERITY	PHYSICIAN'S NAME
1					
2					
3					
4					
5					

BLOOD TYPING

	DATE	TYPE *(International)*	Rh FACTOR	PHYSICIAN'S NAME
1	5JAN56	AB	Negative	J. A. Jones
2				
3				

REMARKS AND RECOMMENDATIONS *(Including history of diseases for which any of the above immunizing agents were given with year and place of attack)*

(1) HYPERSENSITIVE TO ASPIRIN.

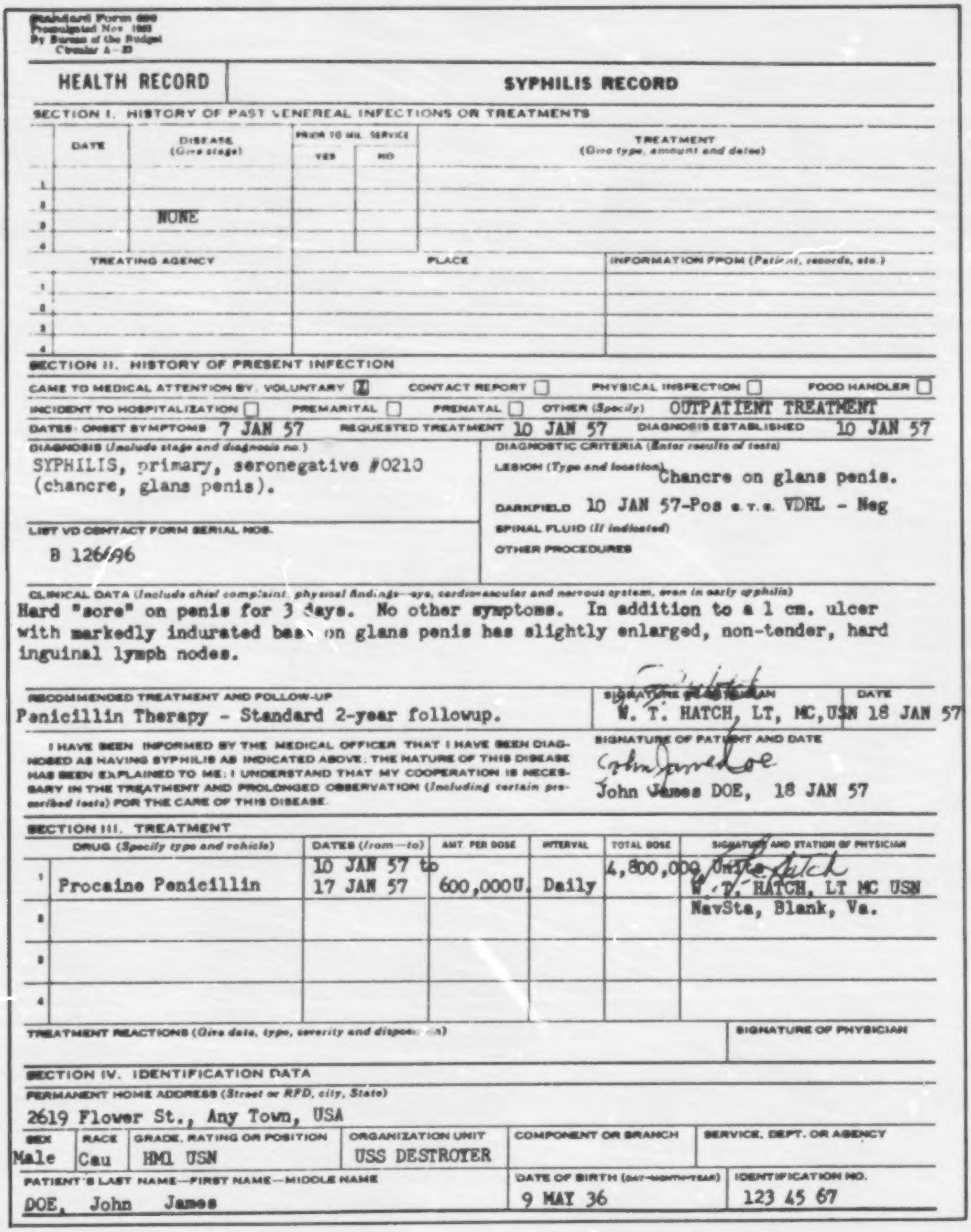
(2) HISTORY MODERATELY SEVERE REACTION TO PARENTERAL PENICILLIN IN 1955.

154.68

Figure 9-11A.—Immunization Record (Back).

Syphilis Record (SF 602)

A separate SF 602 (figs. 9-12 and 9-12A) is prepared upon the occurrence of a syphilitic infection, including any complication or sequela. This record remains a permanent part of the health record until the health record is closed. This procedure is applicable regardless of whether or not more than one SF 602 is required during the member's term of service. An entry



Standard Form [illegible]
Promulgated Nov [illegible]
By Bureau of the Budget
Circular A-[illegible]

HEALTH RECORD | **SYPHILIS RECORD**

SECTION I. HISTORY OF PAST VENEREAL INFECTIONS OR TREATMENTS

	DATE	DISEASE (Give stage)	PRIOR TO MIL. SERVICE YES	PRIOR TO MIL. SERVICE NO	TREATMENT (Give type, amount and dates)
1					
2					
3		NONE			
4					

	TREATING AGENCY	PLACE	INFORMATION FROM (Patient, records, etc.)
1			
2			
3			
4			

SECTION II. HISTORY OF PRESENT INFECTION

CAME TO MEDICAL ATTENTION BY: VOLUNTARY ☒ CONTACT REPORT ☐ PHYSICAL INSPECTION ☐ FOOD HANDLER ☐

INCIDENT TO HOSPITALIZATION ☐ PREMARITAL ☐ PRENATAL ☐ OTHER (Specify) OUTPATIENT TREATMENT

DATES: ONSET SYMPTOMS 7 JAN 57 REQUESTED TREATMENT 10 JAN 57 DIAGNOSIS ESTABLISHED 10 JAN 57

DIAGNOSIS (Include stage and diagnosis no.)
SYPHILIS, primary, seronegative #0210
(chancre, glans penis).

LIST VD CONTACT FORM SERIAL NOS.
B 126496

DIAGNOSTIC CRITERIA (Enter results of tests)
LESION (Type and location) Chancre on glans penis.
DARKFIELD 10 JAN 57-Pos S.T.S. VDRL - Neg
SPINAL FLUID (If indicated)
OTHER PROCEDURES

CLINICAL DATA (Include chief complaint, physical findings—eye, cardiovascular and nervous system, even in early syphilis)
Hard "sore" on penis for 3 days. No other symptoms. In addition to a 1 cm. ulcer with markedly indurated base on glans penis has slightly enlarged, non-tender, hard inguinal lymph nodes.

RECOMMENDED TREATMENT AND FOLLOW-UP
Penicillin Therapy - Standard 2-year followup.

SIGNATURE OF PHYSICIAN
W. T. HATCH, LT, MC, USN

DATE
18 JAN 57

I HAVE BEEN INFORMED BY THE MEDICAL OFFICER THAT I HAVE BEEN DIAGNOSED AS HAVING SYPHILIS AS INDICATED ABOVE; THE NATURE OF THIS DISEASE HAS BEEN EXPLAINED TO ME; I UNDERSTAND THAT MY COOPERATION IS NECESSARY IN THE TREATMENT AND PROLONGED OBSERVATION (Including certain prescribed tests) FOR THE CARE OF THIS DISEASE.

SIGNATURE OF PATIENT AND DATE
John James Doe
John James DOE, 18 JAN 57

SECTION III. TREATMENT

	DRUG (Specify type and vehicle)	DATES (from—to)	AMT. PER DOSE	INTERVAL	TOTAL DOSE	SIGNATURE AND STATION OF PHYSICIAN
1	Procaine Penicillin	10 JAN 57 to 17 JAN 57	600,000U.	Daily	4,800,000 Units	W. T. HATCH, LT MC USN NavSta, Blank, Va.
2						
3						
4						

TREATMENT REACTIONS (Give date, type, severity and disposition)

SIGNATURE OF PHYSICIAN

SECTION IV. IDENTIFICATION DATA

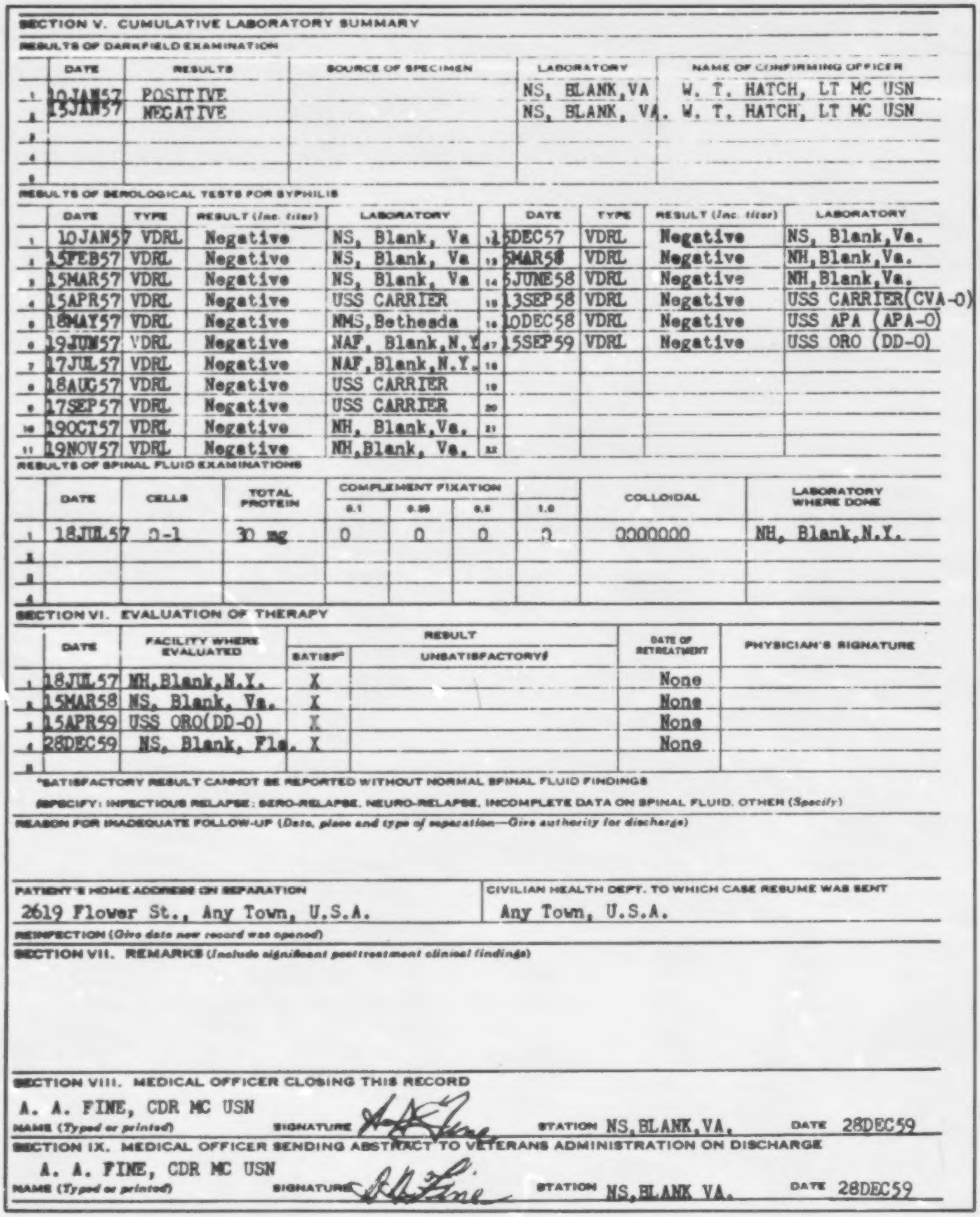
PERMANENT HOME ADDRESS (Street or RFD, city, State)
2619 Flower St., Any Town, USA

SEX	RACE	GRADE, RATING OR POSITION	ORGANIZATION UNIT	COMPONENT OR BRANCH	SERVICE, DEPT. OR AGENCY
Male	Cau	HM1 USN	USS DESTROYER		

PATIENT'S LAST NAME—FIRST NAME—MIDDLE NAME	DATE OF BIRTH (DAY-MONTH-YEAR)	IDENTIFICATION NO.
DOE, John James	9 MAY 36	123 45 67

154.69

Figure 9-12.—Syphilis Record (Front).



SECTION V. CUMULATIVE LABORATORY SUMMARY

RESULTS OF DARKFIELD EXAMINATION

	DATE	RESULTS	SOURCE OF SPECIMEN	LABORATORY	NAME OF CONFIRMING OFFICER
1	10JAN57	POSITIVE		NS, BLANK,VA	W. T. HATCH, LT MC USN
2	15JAN57	NEGATIVE		NS, BLANK, VA.	W. T. HATCH, LT MC USN
3					
4					
5					

RESULTS OF SEROLOGICAL TESTS FOR SYPHILIS

	DATE	TYPE	RESULT (*Inc. titer*)	LABORATORY		DATE	TYPE	RESULT (*Inc. titer*)	LABORATORY
1	10JAN57	VDRL	Negative	NS, Blank, Va	12	15DEC57	VDRL	Negative	NS, Blank,Va.
2	15FEB57	VDRL	Negative	NS, Blank, Va	13	5MAR58	VDRL	Negative	NH,Blank,Va.
3	15MAR57	VDRL	Negative	NS, Blank, Va	14	5JUNE58	VDRL	Negative	NH,Blank,Va.
4	15APR57	VDRL	Negative	USS CARRIER	15	13SEP58	VDRL	Negative	USS CARRIER(CVA-0)
5	18MAY57	VDRL	Negative	NMS,Bethesda	16	10DEC58	VDRL	Negative	USS APA (APA-0)
6	19JUN57	VDRL	Negative	NAF, Blank,N.Y.	17	15SEP59	VDRL	Negative	USS ORO (DD-0)
7	17JUL57	VDRL	Negative	NAF,Blank,N.Y.	18				
8	18AUG57	VDRL	Negative	USS CARRIER	19				
9	17SEP57	VDRL	Negative	USS CARRIER	20				
10	19OCT57	VDRL	Negative	NH, Blank,Va.	21				
11	19NOV57	VDRL	Negative	NH,Blank, Va.	22				

RESULTS OF SPINAL FLUID EXAMINATIONS

	DATE	CELLS	TOTAL PROTEIN	COMPLEMENT FIXATION				COLLOIDAL	LABORATORY WHERE DONE
				0.1	0.25	0.5	1.0		
1	18JUL57	0-1	30 mg	0	0	0	0	0000000	NH, Blank,N.Y.
2									
3									
4									

SECTION VI. EVALUATION OF THERAPY

	DATE	FACILITY WHERE EVALUATED	RESULT		DATE OF RETREATMENT	PHYSICIAN'S SIGNATURE
			SATISF*	UNSATISFACTORY†		
1	18JUL57	NH,Blank,N.Y.	X		None	
2	15MAR58	NS, Blank, Va.	X		None	
3	15APR59	USS ORO(DD-0)	X		None	
4	28DEC59	NS, Blank, Fla.	X		None	
5						

*SATISFACTORY RESULT CANNOT BE REPORTED WITHOUT NORMAL SPINAL FLUID FINDINGS

†SPECIFY: INFECTIOUS RELAPSE; SERO-RELAPSE, NEURO-RELAPSE, INCOMPLETE DATA ON SPINAL FLUID, OTHER (*Specify*)

REASON FOR INADEQUATE FOLLOW-UP (*Date, place and type of separation—Give authority for discharge*)

PATIENT'S HOME ADDRESS ON SEPARATION: 2619 Flower St., Any Town, U.S.A.

CIVILIAN HEALTH DEPT. TO WHICH CASE RESUME WAS SENT: Any Town, U.S.A.

REINFECTION (*Give date new record was opened*)

SECTION VII. REMARKS (*Include significant posttreatment clinical findings*)

SECTION VIII. MEDICAL OFFICER CLOSING THIS RECORD

NAME (*Typed or printed*): A. A. FINE, CDR MC USN
SIGNATURE
STATION: NS,BLANK,VA.
DATE: 28DEC59

SECTION IX. MEDICAL OFFICER SENDING ABSTRACT TO VETERANS ADMINISTRATION ON DISCHARGE

NAME (*Typed or printed*): A. A. FINE, CDR MC USN
SIGNATURE
STATION: NS,BLANK VA.
DATE: 28DEC59

154.69

Figure 9-12A.—Syphilis Record (Back).

will be made for each luetic examination or test conducted and each course of treatment given. Essentially the form is self-explanatory. Abbreviations used in recording treatment should be those officially recognized. Letter designations should not be used for the medications administered.

In section I of the form, list all past sexually transmitted diseases, using only the official nomenclature.

In section II the patient signs the form, indicating that he or she understands the nature of the disease and its treatment. Any discussion with patients concerning their condition and health should be accomplished in private, and the information should be considered privileged.

DENTAL RECORD (SF 603)

The SF 603 (figs. 9-13, 9-13A, and 9-13B) provides the following:

- An aid to diagnosis, treatment planning, and practice management
- A valuable means of identification
- A record of the initial examination of a member, which shows missing teeth, existing restorations, diseases, and other abnormalities
- A record of diseases and other abnormalities that occur after the initial examination
- A chronological record of dental treatment received during the individual's period of military service
- Protection to the Government against false or fraudulent claims and a protection of veteran benefits for the individual
- A basis for dental statistical information
- A means for appraising the physical fitness and dental health profile of the individual

An original dental record is prepared:

- For each individual who reports for, or returns to extended active duty.
- To replace a lost SF 603. It is permanently marked "Replacement."
- At the time the initial examination or dental treatment is provided to a dependent in accordance with current Federal regulations.

The SF 603 will accompany Navy and Marine Corps personnel from activity to activity during their entire period of military service. The dental officer will ensure that the Dental Folder (DD 722-1) with the SF 603, current periapical and bitewing X-rays, and other pertinent dental records are forwarded to the medical officer for inclusion in the Health Record Jacket whenever an individual is transferred. The Medical Department will ensure that the current Dental Folder is included before the health record is transferred.

If the SF 603 or DD 722-1 is not included in the Health Record Jacket when it is transferred, the dental officer will forward it to the individual's new duty station. When this is not possible, the SF 603 will be removed from the DD 722-1 and forwarded to BUMED with a letter explaining the circumstances and advising what action is being taken to ensure that the SF 603 is included in the health record when individuals are transferred. Destroy the DD 722-1 locally in these instances.

The SF 603 is brought up to date by entering in section III all dental restorations, any unrecorded dental treatment, and any dental defects discovered (fig. 9-13A). When all the spaces in section III have been filled, an SF 603A (Dental Continuation) will be used for additional entries (fig. 9-13B).

Special Entries on SF 603

- When dental treatment is refused by a patient, appropriate entries will be made and signed by the dental officer.

- In cases involving dental injuries or diseases incurred due to the person's own misconduct, or not in the line of duty, a notation to that effect will be made and signed by the dental officer. The commanding officer and the person concerned will be informed in writing whenever such an entry is made in the person's dental record (see NAVREGS, art. 1111.2).

- Suitable entries are made whenever a member of the Navy or Marine Corps receives dental treatment in an activity other than the permanent duty station.

- Hypersensitivity to a local anesthetic or any other substance, or valvular or congenital heart disease, will be entered in red pencil across the top of SF 603 and on the outside of DD 722-1. Hypersensitivity to a drug or chemical will also be recorded on the SF 601 and Special SF 600 retained in the health record. Examples: HYPERSENSITIVE TO LIDOCAINE. MITRAL STENOSIS.

- The dental officer will inform the person concerned whenever an entry is made in that person's dental record that may adversely affect, in other than a temporary degree, his or her efficiency in the performance of duty (see NAVREGS, art. 1111.1).

For instructions relative to the recording of dental examinations, see MANMED chapter 6. It is extremely important that the charted record of dental examinations be in exact conformity with the provisions set forth in the manual. The Veteran's Administration depends on the dental record in determining the claim of a veteran for a service-connected dental disability.

DENTAL FOLDER (DD 722-1)

The Dental Folder is prepared for each individual on active duty in the Navy or Marine Corps. It contains the SF 603 and other information pertinent to the dental health of the individual. The contents of the folder are assembled in the following top-to-bottom sequence:

RIGHT SIDE:

Health Record, Dental SF 603
Navy Periodontal Screening Exam, NAVMED 6600/4 (when retained)

LEFT SIDE:

Sequential bitewing radiograph mount
Panographic or full-mouth radiographs
Dental Health Questionnaire, NAVMED 6600/3
Privacy Act Statement, DD Form 2005

When practicable, the Dental Record will be verified with the health, service, and pay records. Otherwise, verification should be accomplished upon reporting, at the time of physical examination, and upon detachment of the individual. An initialed entry to the effect that the verification has been accomplished will be recorded in the designated space on the Dental Folder.

The contents of the Dental Folder will be removed and placed with the medical records in the Health Record Jacket only when the health record is closed. After this is accomplished the Dental Folder is destroyed.

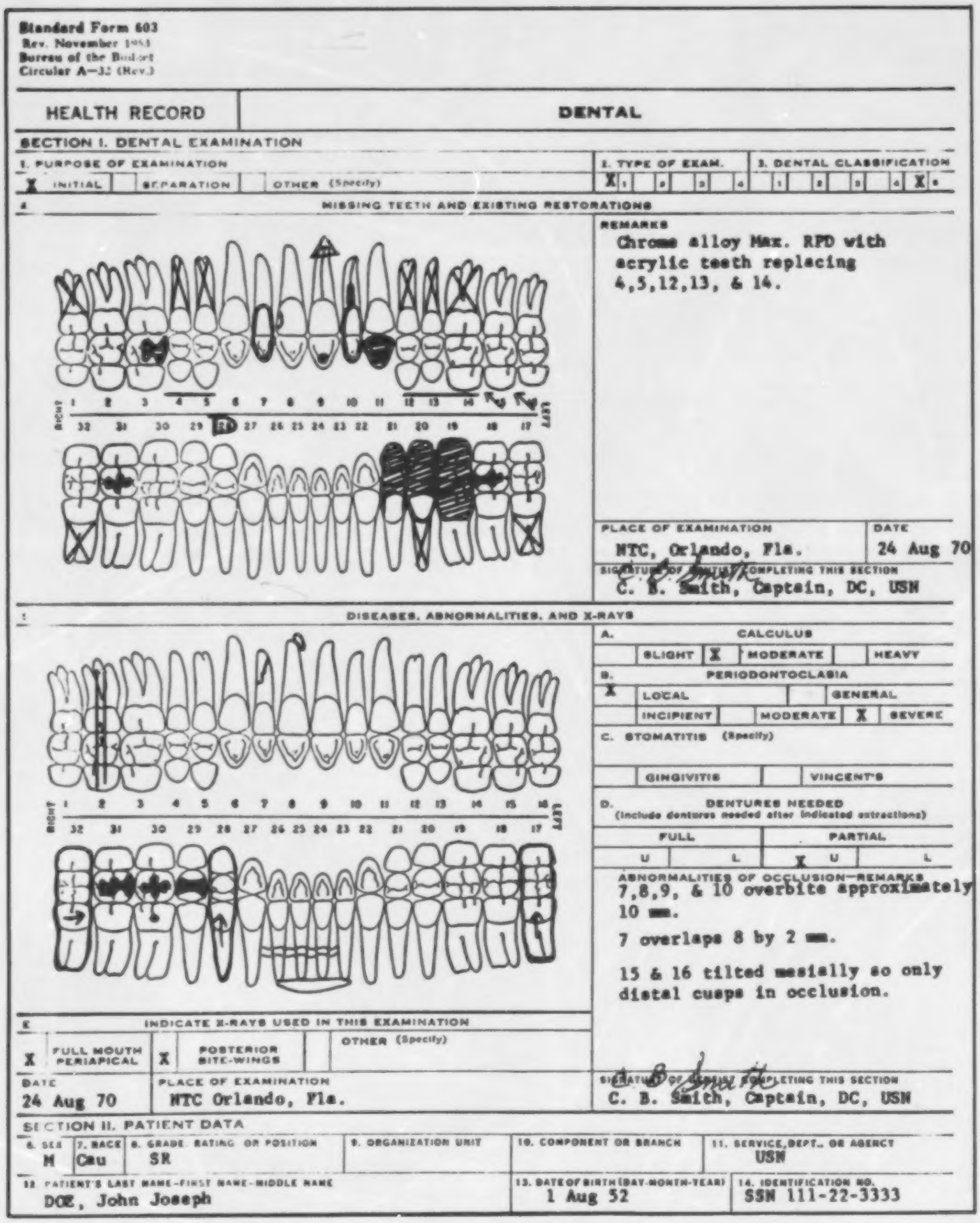
ABSTRACT OF SERVICE AND MEDICAL HISTORY (NAVMED 6150/4)

This form provides a chronological history of ships and stations to which a member has been assigned for duty and treatment and an abstract of medical history for each admission to the sicklist.

A NAVMED 6150/4 (fig. 9-14) is prepared upon opening the health record, and it remains with the health record regardless of any change in the member's status. Continuation sheets are incorporated whenever a current abstract is completely filled.

The form is self-explanatory:

1. Ship or Station Column—Enter the name of the ship or station to which the member is attached for duty or treatment.
2. Diagnosis, Diagnosis Number, and Remarks Column—Enter the reason why the individual is attached to the activity listed in the Ship or Station column, such as "Duty," "Treatment," and "FFT." Enter the diagnosis title and ICDA number each time final disposition from the sicklist is made. When there is more than one diagnosis for a single admission, record each diagnosis.


RIGHT
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
LEFT
32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17

Standard Form 603
Rev. November 1953
Bureau of the Budget
Circular A—32 (Rev.)

HEALTH RECORD	DENTAL

SECTION I. DENTAL EXAMINATION

1. PURPOSE OF EXAMINATION: ☒ INITIAL ☐ SEPARATION ☐ OTHER (Specify)

2. TYPE OF EXAM.: ☒ 1 ☐ 2 ☐ 3 ☐ 4

3. DENTAL CLASSIFICATION: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5

4. MISSING TEETH AND EXISTING RESTORATIONS

REMARKS
Chrome alloy Max. RPD with acrylic teeth replacing 4,5,12,13, & 14.

PLACE OF EXAMINATION	DATE
NTC, Orlando, Fla.	24 Aug 70

SIGNATURE OF DENTIST COMPLETING THIS SECTION
C. B. Smith
C. B. Smith, Captain, DC, USN

5. DISEASES, ABNORMALITIES, AND X-RAYS

A. CALCULUS: ☐ SLIGHT ☒ MODERATE ☐ HEAVY

B. PERIODONTOCLASIA: ☒ LOCAL ☐ GENERAL
☐ INCIPIENT ☐ MODERATE ☒ SEVERE

C. STOMATITIS (Specify)
☐ GINGIVITIS ☐ VINCENT'S

D. DENTURES NEEDED (Include dentures needed after indicated extractions)

FULL		PARTIAL	
U	L	☒ U	L

ABNORMALITIES OF OCCLUSION—REMARKS
7,8,9, & 10 overbite approximately 10 mm.

7 overlaps 8 by 2 mm.

15 & 16 tilted mesially so only distal cusps in occlusion.

E. INDICATE X-RAYS USED IN THIS EXAMINATION: ☒ FULL MOUTH PERIAPICAL ☒ POSTERIOR BITE-WINGS ☐ OTHER (Specify)

DATE	PLACE OF EXAMINATION
24 Aug 70	NTC Orlando, Fla.

SIGNATURE OF DENTIST COMPLETING THIS SECTION
C. B. Smith
C. B. Smith, Captain, DC, USN

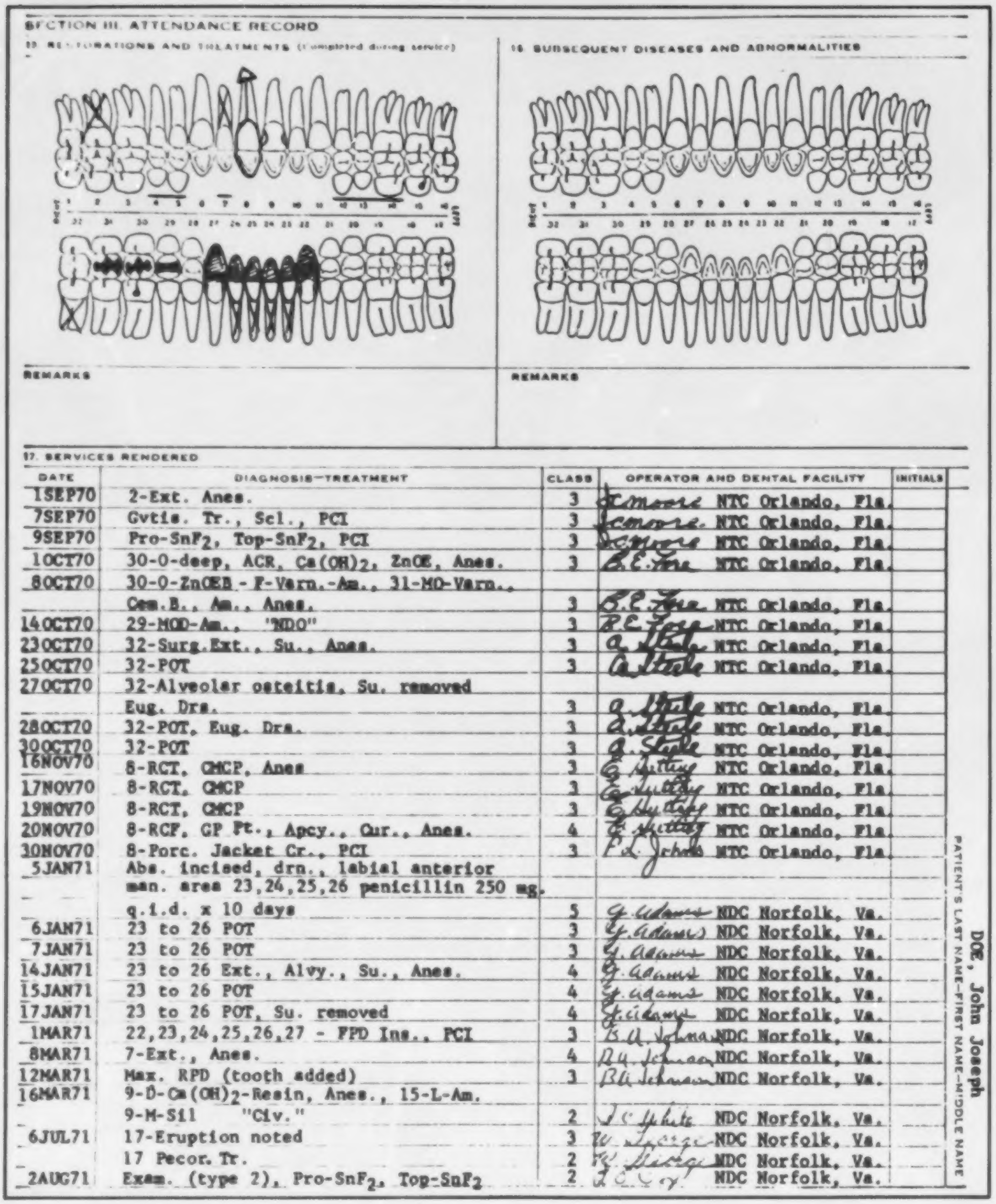
SECTION II. PATIENT DATA

6. SEX	7. RACE	8. GRADE, RATING OR POSITION	9. ORGANIZATION UNIT	10. COMPONENT OR BRANCH	11. SERVICE, DEPT., OR AGENCY
M	Cau	SR			USN

12. PATIENT'S LAST NAME—FIRST NAME—MIDDLE NAME	13. DATE OF BIRTH (DAY-MONTH-YEAR)	14. IDENTIFICATION NO.
DOE, John Joseph	1 Aug 52	SSN 111-22-3333

154.70

Figure 9-13.—Dental Record (Front).


RIGHT
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17
LEFT

SECTION III. ATTENDANCE RECORD

15. RESTORATIONS AND TREATMENTS (Completed during service)

REMARKS

16. SUBSEQUENT DISEASES AND ABNORMALITIES

REMARKS

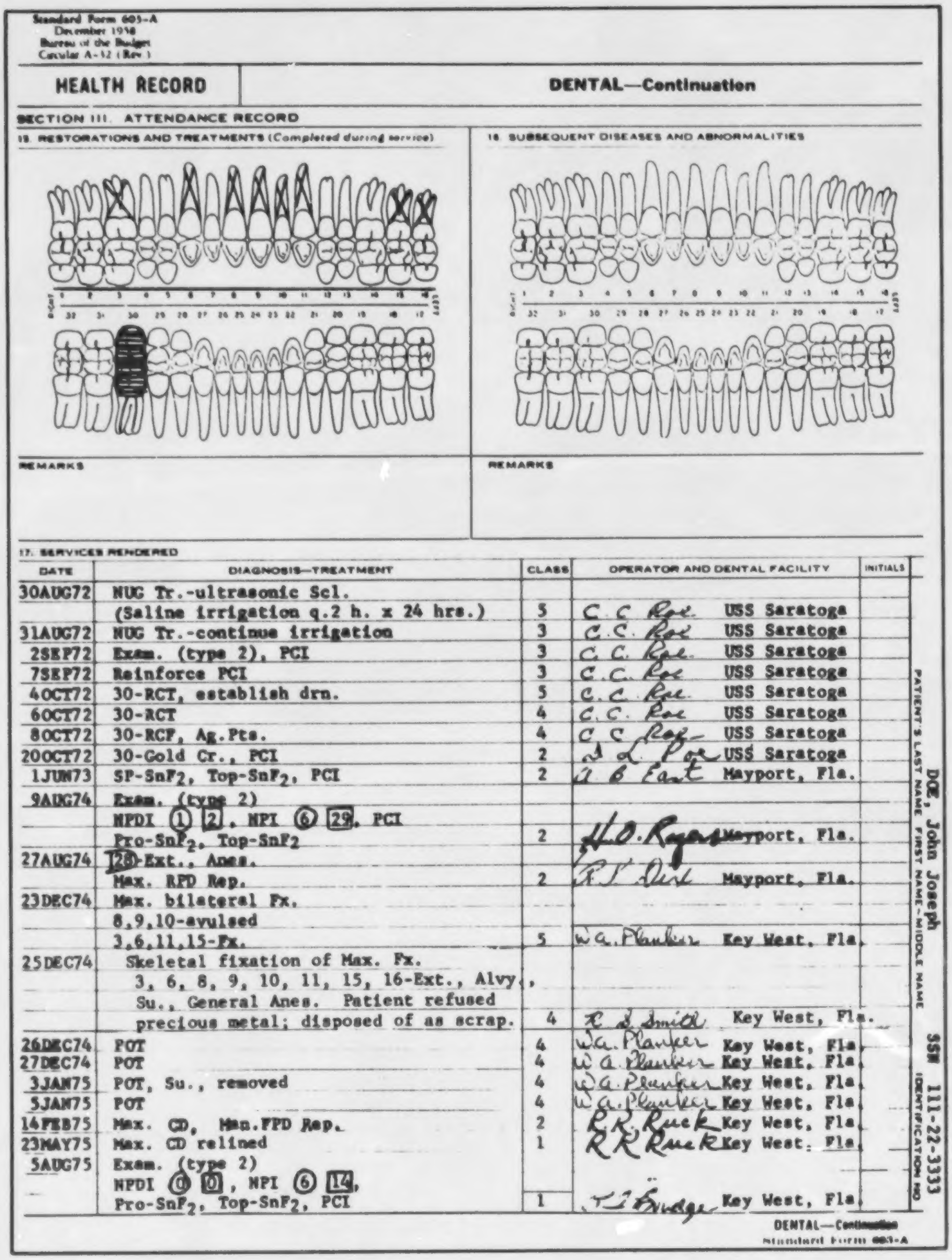
17. SERVICES RENDERED

DATE	DIAGNOSIS—TREATMENT	CLASS	OPERATOR AND DENTAL FACILITY	INITIALS
1SEP70	2-Ext. Anes.	3	J.C. Moore NTC Orlando, Fla.	
7SEP70	Gvtis. Tr., Scl., PCI	3	J.C. Moore NTC Orlando, Fla.	
9SEP70	Pro-SnF$_2$, Top-SnF$_2$, PCI	3	J.C. Moore NTC Orlando, Fla.	
1OCT70	30-O-deep, ACR, Ca(OH)$_2$, ZnOE, Anes.	3	B.E. Fore NTC Orlando, Fla.	
8OCT70	30-O-ZnOEB - F-Varn.-Am., 31-MO-Varn.,			
	Cem.B., Am., Anes.	3	B.E. Fore NTC Orlando, Fla.	
14OCT70	29-MOD-Am., "NDO"	3	B.E. Fore NTC Orlando, Fla.	
23OCT70	32-Surg.Ext., Su., Anes.	3	A. Steele NTC Orlando, Fla.	
25OCT70	32-POT	3	A. Steele NTC Orlando, Fla.	
27OCT70	32-Alveolar osteitis, Su. removed			
	Eug. Drs.	3	A. Steele NTC Orlando, Fla.	
28OCT70	32-POT, Eug. Drs.	3	A. Steele NTC Orlando, Fla.	
30OCT70	32-POT	3	A. Steele NTC Orlando, Fla.	
16NOV70	8-RCT, GMCP, Anes	3	E. Hutting NTC Orlando, Fla.	
17NOV70	8-RCT, GMCP	3	E. Hutting NTC Orlando, Fla.	
19NOV70	8-RCT, GMCP	3	E. Hutting NTC Orlando, Fla.	
20NOV70	8-RCF, GP Pt., Apcy., Cur., Anes.	4	E. Hutting NTC Orlando, Fla.	
30NOV70	8-Porc. Jacket Cr., PCI	3	P.L. Johns NTC Orlando, Fla.	
5JAN71	Abs. incised, drn., labial anterior			
	man. area 23,24,25,26 penicillin 250 mg.			
	q.i.d. x 10 days	5	G. Adams NDC Norfolk, Va.	
6JAN71	23 to 26 POT	3	G. Adams NDC Norfolk, Va.	
7JAN71	23 to 26 POT	3	G. Adams NDC Norfolk, Va.	
14JAN71	23 to 26 Ext., Alvy., Su., Anes.	4	G. Adams NDC Norfolk, Va.	
15JAN71	23 to 26 POT	4	G. Adams NDC Norfolk, Va.	
17JAN71	23 to 26 POT, Su. removed	4	G. Adams NDC Norfolk, Va.	
1MAR71	22,23,24,25,26,27 - FPD Ins., PCI	3	B.A. Johnson NDC Norfolk, Va.	
8MAR71	7-Ext., Anes.	4	B.A. Johnson NDC Norfolk, Va.	
12MAR71	Max. RPD (tooth added)	3	B.A. Johnson NDC Norfolk, Va.	
16MAR71	9-D-Ca(OH)$_2$-Resin, Anes., 15-L-Am.			
	9-M-Sil "Civ."	2	J.C. White NDC Norfolk, Va.	
6JUL71	17-Eruption noted	3	W. George NDC Norfolk, Va.	
	17 Pecor. Tr.	2	W. George NDC Norfolk, Va.	
2AUG71	Exam. (type 2), Pro-SnF$_2$, Top-SnF$_2$	2	NDC Norfolk, Va.	

PATIENT'S LAST NAME—FIRST NAME—MIDDLE NAME
DOE, John Joseph

154.70

Figure 9-13A.—Dental Record (Back).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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17
LEFT

Standard Form 603-A
December 1958
Bureau of the Budget
Circular A-32 (Rev.)

HEALTH RECORD | **DENTAL—Continuation**

SECTION III. ATTENDANCE RECORD

15. RESTORATIONS AND TREATMENTS (*Completed during service*)

16. SUBSEQUENT DISEASES AND ABNORMALITIES

REMARKS

REMARKS

17. SERVICES RENDERED

DATE	DIAGNOSIS—TREATMENT	CLASS	OPERATOR AND DENTAL FACILITY	INITIALS
30AUG72	NUG Tr.-ultrasonic Scl.			
	(Saline irrigation q.2 h. x 24 hrs.)	5	C. C. Roe USS Saratoga	
31AUG72	NUG Tr.-continue irrigation	3	C. C. Roe USS Saratoga	
2SEP72	Exam. (type 2), PCI	3	C. C. Roe USS Saratoga	
7SEP72	Reinforce PCI	3	C. C. Roe USS Saratoga	
4OCT72	30-RCT, establish drn.	5	C. C. Roe USS Saratoga	
6OCT72	30-RCT	4	C. C. Roe USS Saratoga	
8OCT72	30-RCF, Ag.Pts.	4	C. C. Roe USS Saratoga	
20OCT72	30-Gold Cr., PCI	2	J. L. Poe USS Saratoga	
1JUN73	SP-SnF$_2$, Top-SnF$_2$, PCI	2	A. B. East Mayport, Fla.	
9AUG74	Exam. (type 2)			
	NPDI ① $\boxed{2}$, NPI ⑥ $\boxed{29}$, PCI			
	Pro-SnF$_2$, Top-SnF$_2$	2	H. O. Rogers Mayport, Fla.	
27AUG74	$\boxed{28}$-Ext., Anes.			
	Max. RPD Rep.	2	R. T. Dirt Mayport, Fla.	
23DEC74	Max. bilateral Fx.			
	8,9,10-avulsed			
	3,6,11,15-Fx.	5	W. A. Planker Key West, Fla.	
25DEC74	Skeletal fixation of Max. Fx.			
	3, 6, 8, 9, 10, 11, 15, 16-Ext., Alvy.,			
	Su., General Anes. Patient refused			
	precious metal; disposed of as scrap.	4	R. S. Smith Key West, Fla.	
26DEC74	POT	4	W. A. Planker Key West, Fla.	
27DEC74	POT	4	W. A. Planker Key West, Fla.	
3JAN75	POT, Su., removed	4	W. A. Planker Key West, Fla.	
5JAN75	POT	4	W. A. Planker Key West, Fla.	
14FEB75	Max. CD, Man.FPD Rep.	2	R. R. Ruck Key West, Fla.	
23MAY75	Max. CD relined	1	R. R. Ruck Key West, Fla.	
5AUG75	Exam. (type 2)			
	NPDI ⓪ $\boxed{0}$, NPI ⑥ $\boxed{14}$,			
	Pro-SnF$_2$, Top-SnF$_2$, PCI	1	T. T. Budge Key West, Fla.	

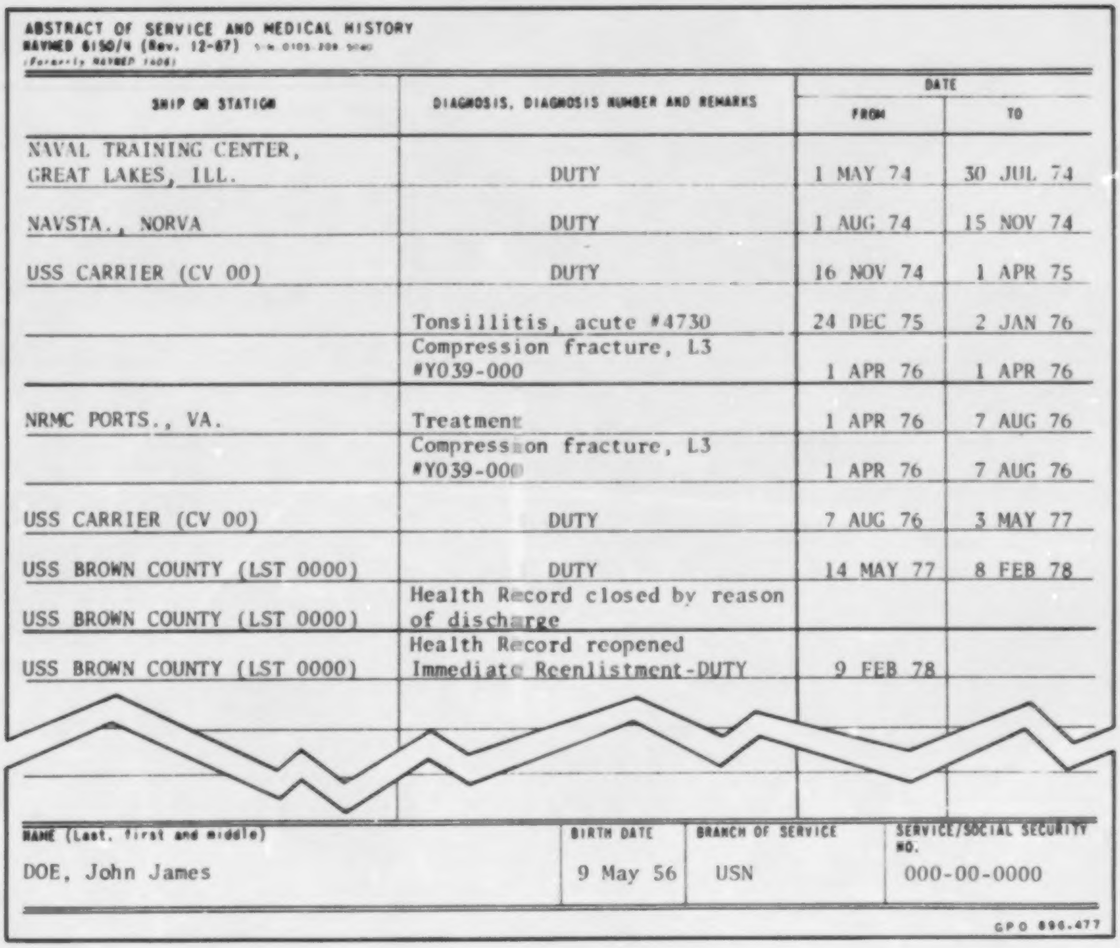
PATIENT'S LAST NAME FIRST NAME-MIDDLE NAME: DOE, John Joseph

SSN IDENTIFICATION NO: 111-22-3333

DENTAL—Continuation
Standard Form 603-A

154.70

Figure 9-13B.—Dental Record (Continuation).



ABSTRACT OF SERVICE AND MEDICAL HISTORY
NAVMED 6150/4 (Rev. 12-67) [illegible]
(Formerly NAVMED 1406)

SHIP OR STATION	DIAGNOSIS, DIAGNOSIS NUMBER AND REMARKS	DATE	
		FROM	TO
NAVAL TRAINING CENTER, GREAT LAKES, ILL.	DUTY	1 MAY 74	30 JUL 74
NAVSTA., NORVA	DUTY	1 AUG 74	15 NOV 74
USS CARRIER (CV 00)	DUTY	16 NOV 74	1 APR 75
	Tonsillitis, acute #4730	24 DEC 75	2 JAN 76
	Compression fracture, L3 #Y039-000	1 APR 76	1 APR 76
NRMC PORTS., VA.	Treatment	1 APR 76	7 AUG 76
	Compression fracture, L3 #Y039-000	1 APR 76	7 AUG 76
USS CARRIER (CV 00)	DUTY	7 AUG 76	3 MAY 77
USS BROWN COUNTY (LST 0000)	DUTY	14 MAY 77	8 FEB 78
USS BROWN COUNTY (LST 0000)	Health Record closed by reason of discharge		
USS BROWN COUNTY (LST 0000)	Health Record reopened Immediate Reenlistment-DUTY	9 FEB 78	

NAME (Last, first and middle)	BIRTH DATE	BRANCH OF SERVICE	SERVICE/SOCIAL SECURITY NO.
DOE, John James	9 May 56	USN	000-00-0000

GPO 896-477

154.71

Figure 9-14.—Abstract of Service and Medical History.

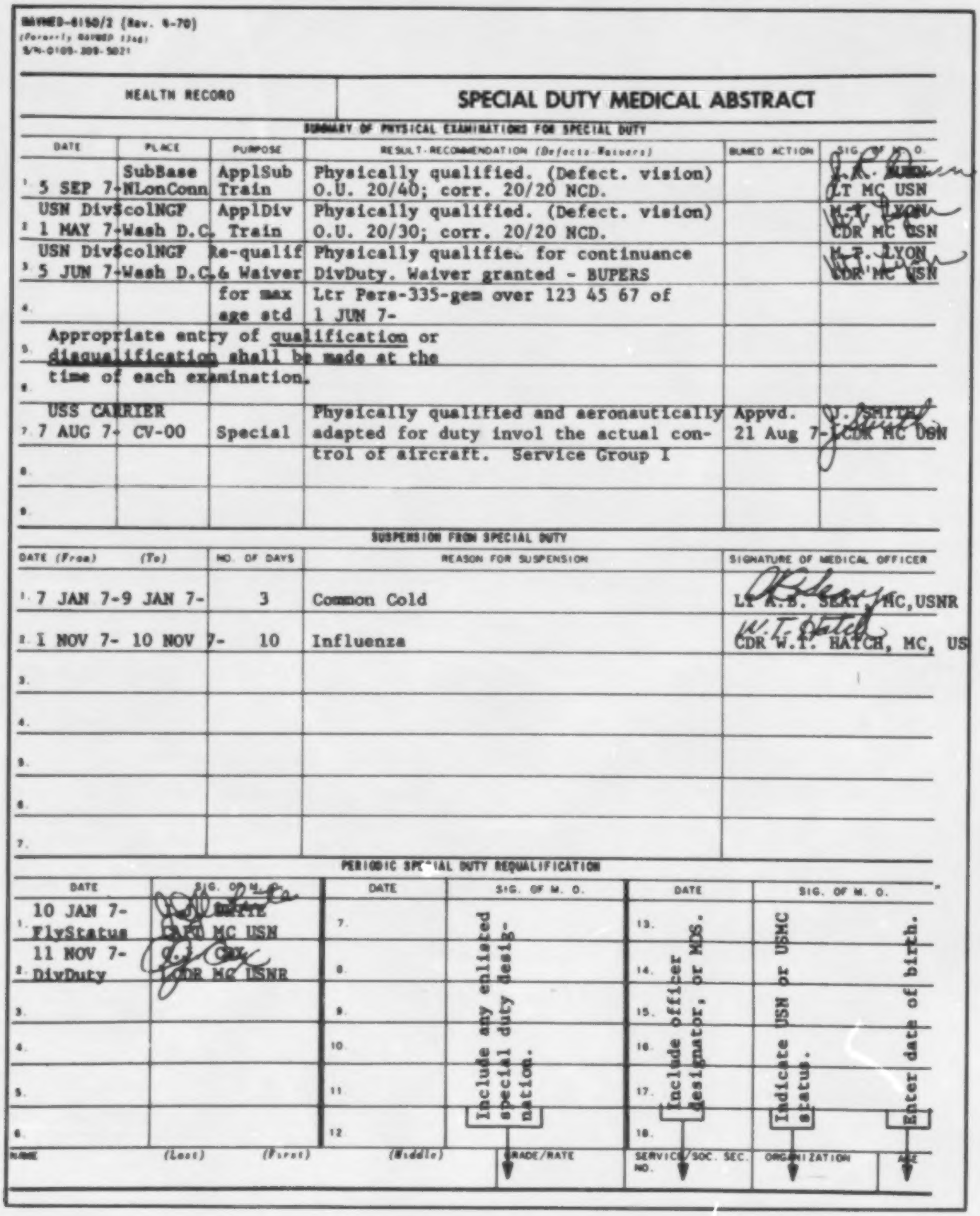
3. Date Column—Indicate in the FROM and TO subcolumns all dates of reporting and detachment for duty or dates of admission and discharge from the sicklist. Upon transfer for temporary duty (TDY), an entry will be made only if the health record is to accompany the individual to the place of TDY.

NAVMED 6150/4 is retained as a permanent part of the health record until closure of the record. The entry upon closure will indicate date, title of the servicing activity, and explanatory circumstances as may be indicated.

Upon discharge and immediate reenlistment, or change in status, an appropriate entry to this effect is made on the current NAVMED 6150/4. Subsequent chronological entries are continued on the same form.

SPECIAL DUTY MEDICAL ABSTRACT (NAVMED 6150/2)

The purpose of NAVMED 6150/2 (figs. 9-15 and 9-15A) is to provide a record of physical qualifications, special training, and periodic examinations of members designated for special



NAVMED-6150/2 (Rev. 4-70)
(Formerly NAVMED 1346)
S/N-0105-309-5021

HEALTH RECORD

SPECIAL DUTY MEDICAL ABSTRACT

SUMMARY OF PHYSICAL EXAMINATIONS FOR SPECIAL DUTY

	DATE	PLACE	PURPOSE	RESULT-RECOMMENDATION (Defects-Waivers)	BUMED ACTION	SIG. OF M. O.
1.	5 SEP 7-	SubBase NLonConn	ApplSub Train	Physically qualified. (Defect. vision) O.U. 20/40; corr. 20/20 NCD.		J.K. [illegible] LT MC USN
2.	USN DivScolNGF 1 MAY 7-	Wash D.C.	ApplDiv Train	Physically qualified. (Defect. vision) O.U. 20/30; corr. 20/20 NCD.		M.T. LYON CDR MC USN
3.	USN DivScolNGF 5 JUN 7-	Wash D.C.	Re-qualif & Waiver	Physically qualified for continuance DivDuty. Waiver granted - BUPERS		M.T. LYON CDR MC USN
4.			for max age std	Ltr Pers-335-gem over 123 45 67 of 1 JUN 7-		
5.	Appropriate entry of qualification or					
6.	disqualification shall be made at the time of each examination.					
7.	USS CARRIER 7 AUG 7-	CV-00	Special	Physically qualified and aeronautically adapted for duty invol the actual con-	Appvd. 21 Aug 7-	J. SMITH CDR MC USN
8.				trol of aircraft. Service Group I		
9.						

SUSPENSION FROM SPECIAL DUTY

	DATE (From)	(To)	NO. OF DAYS	REASON FOR SUSPENSION	SIGNATURE OF MEDICAL OFFICER
1.	7 JAN 7-	9 JAN 7-	3	Common Cold	LT A.B. SEAY, MC,USNR
2.	1 NOV 7-	10 NOV 7-	10	Influenza	W.T. Hatch CDR W.T. HATCH, MC, US
3.					
4.					
5.					
6.					
7.					

PERIODIC SPECIAL DUTY REQUALIFICATION

	DATE	SIG. OF M. O.		DATE	SIG. OF M. O.		DATE	SIG. OF M. O.
1.	10 JAN 7- FlyStatus	[illegible] CAPT MC USN	7.			13.		
2.	11 NOV 7- DivDuty	C.J. COX LCDR MC USNR	8.			14.		
3.			9.			15.		
4.			10.			16.		
5.			11.			17.		
6.			12.			18.		

Include any enlisted special duty designation.

Include officer designator, or MDS.

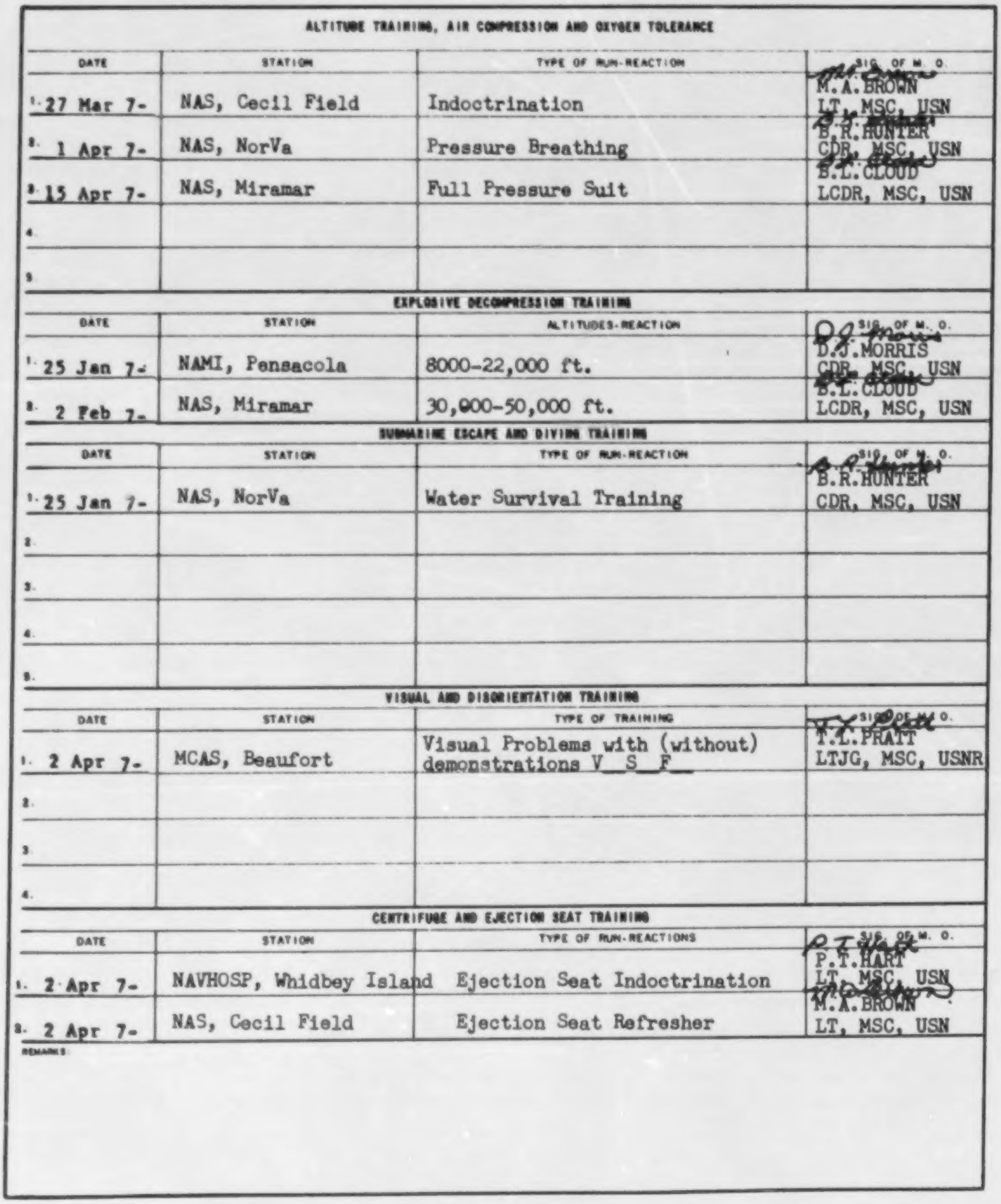
Indicate USN or USMC status.

Enter date of birth.

NAME (Last) (First) (Middle)	GRADE/RATE	SERVICE/SOC. SEC. NO.	ORGANIZATION	AGE

154.72

Figure 9-15.—Special Duty Medical Abstract (Front).



ALTITUDE TRAINING, AIR COMPRESSION AND OXYGEN TOLERANCE

DATE	STATION	TYPE OF RUN-REACTION	SIG. OF M. O.
1. 27 Mar 7-	NAS, Cecil Field	Indoctrination	M.A.BROWN LT, MSC, USN
2. 1 Apr 7-	NAS, NorVa	Pressure Breathing	B.R.HUNTER CDR, MSC, USN
3. 15 Apr 7-	NAS, Miramar	Full Pressure Suit	B.L.CLOUD LCDR, MSC, USN
4.			
5.			

EXPLOSIVE DECOMPRESSION TRAINING

DATE	STATION	ALTITUDES-REACTION	SIG. OF M. O.
1. 25 Jan 7-	NAMI, Pensacola	8000-22,000 ft.	D.J.MORRIS CDR, MSC, USN
2. 2 Feb 7-	NAS, Miramar	30,000-50,000 ft.	B.L.CLOUD LCDR, MSC, USN

SUBMARINE ESCAPE AND DIVING TRAINING

DATE	STATION	TYPE OF RUN-REACTION	SIG. OF M. O.
1. 25 Jan 7-	NAS, NorVa	Water Survival Training	B.R.HUNTER CDR, MSC, USN
2.			
3.			
4.			
5.			

VISUAL AND DISORIENTATION TRAINING

DATE	STATION	TYPE OF TRAINING	SIG. OF M. O.
1. 2 Apr 7-	MCAS, Beaufort	Visual Problems with (without) demonstrations V__S__F__	T.L.PRATT LTJG, MSC, USNR
2.			
3.			
4.			

CENTRIFUGE AND EJECTION SEAT TRAINING

DATE	STATION	TYPE OF RUN-REACTIONS	SIG. OF M. O.
1. 2 Apr 7-	NAVHOSP, Whidbey Island	Ejection Seat Indoctrination	P.T.HART LT, MSC, USN
2. 2 Apr 7-	NAS, Cecil Field	Ejection Seat Refresher	M.A.BROWN LT, MSC, USN

REMARKS:

154.72

Figure 9-15A.—Special Duty Medical Abstract (Back).

duty, such as aviation, submarine, and diving. The object of the special duty examination is to select only those individuals who are physically and mentally qualified for such special duty, and to remove from such status those members who have physical or mental defects. Also, special money disbursements are often based upon the determination of a member's physical and mental qualifications or continued requalification for performance of a special duty. Therefore, accuracy of information is essential in reporting information applicable to these categories.

This form is opened or prepared initially upon a member's first special duty examination or training. Once it has been activated, it remains an integral part of the health record. Upon a member's discharge and immediate reenlistment, NAVMED 6150/2 is retained in the new health record. Whenever additional space under any category is required, an additional NAVMED 6150/2 is prepared and numbered sequentially, with the most recent on top.

Entries are recorded upon completion of each special duty examination and completion of special training. A hospitalized member is automatically suspended from special duties, and an entry to this effect is made on the form. When a previously qualified member is suspended from special duty or training for physical reasons, the period of suspension and reasons therefor are entered in the appropriate section of the form.

The scope of the physical examination and technical training prescribed for these special categories often differs from the general service requirements; therefore, entries reporting results that pertain to these particular examinations or training involved will be approved only by medical officers or specially designated medical service officers who are familiar with their scope and nature (e.g., aerospace physiologists for aerospace physiology training).

RECORD OF OCCUPATIONAL EXPOSURE TO IONIZING RADIATION (DD Form 1141)

This form is initiated when military personnel are first exposed to ionizing radiation. (Exception: Ionizing radiation incurred by patients undergoing diagnostic procedures and treatment.) Thereafter it becomes a permanent part of the member's health record.

Instructions for preparing DD Form 1141 are on the back of the form. Further instructions concerning the applicability and use of the form and the source of necessary information are contained in the Radiation Health Protection Manual, NAVMED P-5055.

ADJUNCT HEALTH RECORD FORMS AND REPORTS

This section provides instructions for using certain forms in the health record in lieu of transcribing their data to the SF 600, Chronological Record of Medical Care.

Narrative Summay (SF 502)

The purpose of the SF 502 is to summarize pertinent clinical data relative to treatment received during periods of hospitalization. For all members (officer and enlisted), the original (typewritten) SF 502 is placed in the health record. For both officer and enlisted members, entries concerning admissions to the sicklist, showing the nature of the disease, illness or injury, pertinent history or circumstances of occurrence, treatment rendered, and disposition, will be entered on the SF 502. Also indicate whether the disease or injury was or was not suffered in the ine of duty and was or was not due to the member's own misconduct.

Abbreviated Clinical Record (SF 539)

A copy of SF 539 may be filed in the health record when used for active duty personnel in uncomplicated inpatient care of brief duration (less than 48 hours of hospitalization) and when SF 502 is not otherwise required. However, the information entered on SF 539 must be legible and provide adequate documentation concerning the origin, nature, conduct, status, and aggravation by service, if any, of the condition requiring hospitalization.

Consultation Sheet (SF 513)

When a report of consultation on an outpatient is recorded on SF 513, it may be incorporated directly into the health record. The SF 513 may be used by dental officers requesting a medical consultation on a dental patient. The SF 513 is to be included in the member's health record.

If the SF 513 is not legible, transcribe the information to the SF 600. The results of all laboratory examinations performed in conjunction with the consultation are transcribed to the SF 513.

Medical Board Report (NAVMED 6100/1)

Whenever a member of the naval service is reported on by a medical board, a legible copy of the report may be placed in the health record in lieu of transcribing the clinical data to the SF 600. A notation is also made on the current SF 600 to indicate that the clinical data is contained in the copy of the Medical Board Report incorporated in the health record. When the Medical Board Report is forwarded to the Navy Department for review and appropriate disposition, a report of the departmental action is entered on the current SF 600.

Disposition of Adjunct Forms or Reports

All original SF 502s, baseline audiograms, baseline electrocardiograms, and a copy of the Medical Board Report and SF 539s will be retained in the member's health record.

INDIVIDUAL SICK SLIP (DD 689)

This form (fig. 9-16) is devised for the purpose of cross-medical-service notification between the armed services. DD 689 may also be used to exchange information between the medical officer concerned and the unit commander within the naval establishment: When a member, following treatment, is unable to return to his or her organization either for duty or reporting purposes, use of the form does not preclude the immediate notification of a member's unit commander by telephone or message. This form may be initiated for an individual who has requested or received medical treatment of a sick call nature. It serves as an interim document to furnish information from which subsequent entries are recorded in the health record. It is not prepared when direct cross-servicing of the health record is performed.

DD 689 is not a record document and should be disposed of as soon as the information is transcribed to the SF 600, except where further use is indicated in connection with line-of-duty determination.

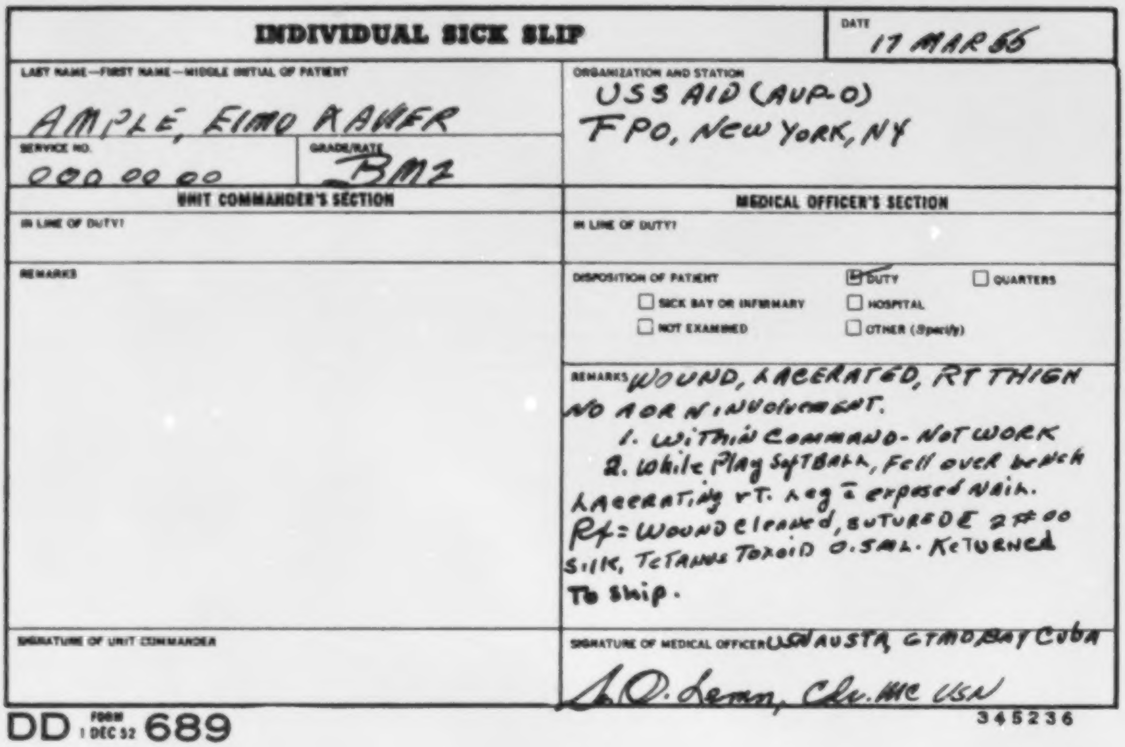
Preparation and use of this form is discussed in MANMED, chapter 16.

PHYSICAL EXAMINATIONS

The Chief of BUMED prescribes the physical standards by which personnel are enlisted, appointed, or commissioned within the naval establishment. Although BUMED takes the initiative in their development, the standards represent the concurrence of all interested commands within the Department of the Navy and the Commandant of the Marine Corps.

The physical standards are established to secure uniformity in conducting physical examinations and in interpreting the physical fitness of candidates for, and persons in, the naval service. The object is to procure and retain personnel who are physically fit and temperamentally adaptable to the conditions of military life. This is intended to preclude from acceptance those individuals who have a contagious or an infectious disease; those who are likely to require repeated admissions to the sicklist or prolonged hospitalization; and those who have a condition that would be likely to form the basis of a claim for physical retirement benefits.

The standards, therefore, delineate a degree of physical fitness that will best meet the needs of the naval service yet involve an acceptable minimum of risk concerning liability for health



INDIVIDUAL SICK SLIP

DATE 17 MAR 65

LAST NAME—FIRST NAME—MIDDLE INITIAL OF PATIENT: AMPLE, ELMO RAWER

SERVICE NO.: 000 00 00

GRADE/RATE: BM2

ORGANIZATION AND STATION: USS AID (AVP-0)
FPO, NEW YORK, NY

UNIT COMMANDER'S SECTION

IN LINE OF DUTY?

REMARKS

SIGNATURE OF UNIT COMMANDER

MEDICAL OFFICER'S SECTION

IN LINE OF DUTY?

DISPOSITION OF PATIENT ☑ DUTY ☐ QUARTERS ☐ SICK BAY OR INFIRMARY ☐ HOSPITAL ☐ NOT EXAMINED ☐ OTHER (Specify)

REMARKS WOUND, LACERATED, RT THIGH
NO AOR N INVOLVEMENT.
1. WITHIN COMMAND - NOT WORK
2. While Play SoftBall, Fell over bench lacerating rT. leg c̄ exposed Nail.
Rx: Wound cleaned, SUTURED 2 #00 silk, Tetanus Toxoid 0.5ML. Returned To Ship.

SIGNATURE OF MEDICAL OFFICER USNAVSTA, GTMO BAY Cuba
S. O. Lemn, Cdr. MC USN

DD FORM 1 DEC 52 689

345236

154.73

Figure 9-16.—Individual Sick Slip.

hazards, repeated or prolonged medical care or hospitalization, assignment problems, and eventual pension or retirement benefits. This required degree of physical fitness is correlated with the available supply of applicants for military service and normal service needs. Depending upon the personnel needs of the naval service at any given time, these standards are subject to change.

The present physical standards for enlistment, reenlistment, or induction of enlisted men are contained in *Army Regulations* (AR 40-501), chapter 2, Standards of Medical Fitness for Enlistment and Induction.

The physical standards for enlistment or appointment of women, appointment of men in any category (including U.S. Naval Academy and NROTC applicants), enrollment of officer candidates in Navy or Marine Corps programs, and special duty categories (i.e., aviation, submarine, diving, and nuclear field) are prescribed in MANMED, and the *Navy Directives System* (under the specific reason for the examination).

ENLISTMENT AND REENLISTMENT

The physical examination of applicants for enlistment in the Navy or Marine Corps, Regular or Reserve, is made by naval medical and dental officers. If none are available, the examinations are conducted by medical and dental officers of the Department of the Army or the Department of the Air Force or by civilian physicians when authorized by the Commander, Naval Military Personnel Command (NMPC) or the Commandant of the Marine Corps (CMC) upon the recommendation of the Chief, BUMED. Except in the case of members on active duty who are applicants for extension or reenlistment, civilian physicians may be utilized only on a no-cost-to-the-Navy basis. The results of this examination, as well as all physical abnormalities, will be recorded in the health record.

Reenlistment pertains to an enlistment in the Navy or the Marine Corps of a person who has had prior service in the Navy or the Marine Corps. The physical standards for reenlistment are the same as those for the original enlistment. Where medical officers of the Department of Defense are not readily available, a waiver of the physical examination is authorized for reenlistment within 24 hours following discharge, provided there is no evidence in the member's health record of recent illness or injury or change in status. The physical examination by a Department of Defense medical officer will be obtained at the earliest opportunity. An appropriate notation is made in the member's health record to ensure that the requirement for physical examination is not overlooked.

The applications of persons desiring to reenlist who have defects or disabilities that ordinarily would be cause for rejection for original enlistment, but will not interfere with the performance of the duties expected of them, will be referred to NMPC or CMC via BUMED with appropriate recommendations for waiver if it has been demonstrated that the defect or disability did not interfere with the performance of duty during the original enlistment.

RECRUIT SCREENING EXAMINATION

The purpose of this examination is to detect physical or mental defects or active disease processes that may have been concealed or were not detected at the time of enlistment or induction and to ensure that certain laboratory tests, chest X-rays, or other indicated tests are accomplished if facilities were unavailable at the original examining facility.

The screening examination will be conducted within 10 days of reporting to the naval training center or the Marine Corps recruit depot.

The examination is sufficiently thorough to ensure that the recruit is free from communicable and infectious disease and is physically fit to undergo military training.

Reporting Procedures

Enlistment—The original SF 88 and SF 93 are attached to the enlistment contract and forwarded with the other enlistment documents to NMPC or CMC, as appropriate. Signed copies of the SF 88 and SF 93 are placed in the newly opened health record.

Reenlistment—The original SF 88 or SF 600, as appropriate, is placed in the health record.

PHYSICAL EXAMINATION OF ACTIVE DUTY OFFICERS (TRIENNIAL/ANNUAL)

The purpose of this examination is to detect disease processes in their early stages, thereby permitting earlier therapy, and to maintain current medical data regarding physical fitness of officer personnel.

When conducted:

- All officers assigned to duty that requires performance of frequent aerial flights will receive an annual flight physical examination within 30 days of the anniversary of the officer's date of birth.

- All flag and general officers will receive an annual physical examination within 30 days of the officer's date of birth.

- All other Navy and Marine Corps officers on active duty will be examined within 30 days of the anniversary of the officer's date of birth at ages 24, 27, 30, 33, 36, and annually thereafter.

- A complete physical examination conducted and reported to BUMED during the previous 12 months will obviate the need for the annual physical examination, except for flag and general officers. Their annual physical examination is conducted regardless of previous examinations during the year. (See MANMED for special procedures.)

- Any officer may, at his or her request, be examined at any time such examination is medically indicated.

The examination may be conducted by any medical officer of the Department of Defense on active duty. Whenever possible, and particularly for those officers over 36, the examination should be conducted by a qualified internist.

In the case of aviation personnel, at least one of the examining medical officers will be a flight surgeon or an aviation medical examiner.

The examination will be sufficiently thorough, including the completion of NAVMED 6120/2 (Officer Physical Examination Questionnaire), to make reasonably certain that the officer concerned is free of incipient disease or functional impairment. It will include the following examinations:

- Electrocardiographic tracings and intraocular tension determination on all officers 36 years of age or older.

- Examination of the prostate gland on all male officers 36 years of age or older and in all others where indicated.

- A pelvic and breast examination and a Papanicolaou smear will be performed on all female officers. The presence of a female attendant is required and the examinee must be properly draped. All female officers below the age of 36 are encouraged to request an annual Papanicolaou smear and such other examinations as may be recommended by specialists in obstetrics and gynecology.

- A serological test for syphilis, using the standard serological technique, is required for examinees at the following ages: 24, 27, 30, 33, 36, 40, and 45.

- The hematocrit level will be determined and recorded in block 50 of SF 88.

Examining medical officers are responsible for reviewing all physical examinations done by them. When they sign the SF 88, they certify that the information entered is complete and accurate to the best of their knowledge.

The disposition of officers as a result of the physical examination depends upon many factors, any number of which may apply in a case. The object is to begin indicated measures early enough to protect the officer's health. When no conditions of importance are noted, no action is required. The discovery of conditions of importance may only require giving appropriate clinical advice, or it may require consultations, continuing observation, treatment in a duty status, or hospitalization.

In all cases requiring an examination, the SF 88 is prepared as completely as necessary and will contain the opinions and recommendations of the examiner. The SF 88 may either be handwritten in black or blue-black ink or typed. Should the examination not be required, record the reason on the SF 600. The original SF 88 and Questionnaire will be filed in the health record except in the following cases:

- Flag and General officers—submit a copy of the completed SF 88 and Questionnaire and a copy of all medical information entered in the officer's health record subsequent to completion of the previous annual physical examination to BUMED (3322). Upon completion of the first annual physical subsequent to promotion to flag rank, a copy of the officer's entire health record is submitted.

- Aviation personnel—Submit the typewritten original SF 88 and Questionnaire to BUMED (511). File copy of SF 88 and Questionnaire in the officer's health record.

- Divers—Submit a copy of the SF 88 and Questionnaire to BUMED (53). File original SF 88 and Questionnaire in officer's health record.

ANNUAL PHYSICAL EXAMINATIONS OF CERTAIN ENLISTED MEMBERS

The purpose of the examination is early detection of acute or chronic disease processes, thereby permitting early therapy. The examination also aids in determining the presence of defects that might preclude reasonable performance of sea or field duty or that might be a hazard to the member in the performance of such duty.

The annual examination applies to the following enlisted, active duty members (men and women) who have not otherwise undergone a complete physical examination within 12 months:

- Navy and Marine Corps personnel, age 40 and over, within 30 days of their birthdays.

- Marine Corps personnel, 36 years of age or older, serving at Marine Corps bases or camps, recruit depots, air stations, air facilities, Marine Corps Schools at Quantico, and with Fleet Marine Force units, within 30 days of their birthdays, to determine physical fitness for combat readiness.

- Women under 40 are encouraged to request an annual physical examination similar to that for female officers.

The results of the examination will be recorded on SF 600, except in the case of aviation personnel. The entry will include

- date of examination;

- title of examining activity;

- all defects noted;

- specific comments as to the physical fitness for performance of duties at sea, foreign shore, or in the field; and

- signature of the medical examiner.

For members not needing a birth date examination because they underwent a complete examination during the preceding 12 months, an entry will be made on the SF 600 during the birth date period. A copy of the report of the annual physical examination is not required or desired by BUMED, except in special cases.

SEPARATION FROM ACTIVE DUTY

Prior to separation from active duty (e.g., retirement, discharge, expiration of enlistment, or transfer to the Fleet Reserve) every member will be given a thorough physical examination. However, a member who has been evaluated by a medical board incident to separation from active duty need not undergo further physical examination at the time of separation. All necessary tests and examinations will be completed, interpreted, and properly recorded to ensure that the member is physically qualified for release from active service before the actual date of release. An approved serological test for syphilis, tuberculin skin test, and a chest X-ray will be completed within the prescribed time before separation. (See MANMED and BUMEDINST 6224.1 series.) All results must be evaluated and recorded before separation.

Each member separated from active duty will be given a legible copy of his or her separation SF 88 with the following preprinted statement: "You have been examined and found physically fit for separation from active duty. Any defects noted during this examination are recorded in block 74 of the attached Report of Medical Examination (SF 88). Although the defects listed do not disqualify you for the performance of your duties or entitle you to disability benefits from the naval service, you may be entitled to certain benefits from the Veterans' Administration. In this connection you should be counseled by the VA representative attached to your separation activity, if one is available, concerning the filing of claims for compensation with the Veterans' Administration. Otherwise, it is suggested that you contact the Veterans' Administration Regional Office nearest your home as soon as practicable after separation or retirement." Disposition of the separation SF 88 will be as follows:

- Original—Place in closed out health record and forward to the command holding the service record.

- Copy—Provide legible copy to the individual.

TRANSFER OF PERSONNEL (OFFICER AND ENLISTED)

Prior to transfer of personnel from the old duty station to the new duty station (i.e., shore to shore, shore to sea or overseas, sea to shore, and various types of isolated or restricted duty) the member's medical and dental records will be assembled and reviewed by appropriate medical personnel to determine the member's medical acceptability for transfer. In some cases the member may be questioned concerning his or her physical condition, with special emphasis being given to any recent serious illness, injury, or operation. An entry that the records have been screened will be made on SF 600, dated, and signed. Members not physically qualified for transfer will be referred to the appropriate medical facility for evaluation. Immediately notify the member's command so that indicated administrative action can be initiated.

SUBMARINE PERSONNEL

In view of the special conditions characteristic of the submarine service, all officers and enlisted personnel who are assigned to submarine duty or who are candidates for submarine training will conform to the standards set forth in MANMED Chapter 15. Submarine candidates are required to establish their physical fitness as amplified by current directives before reporting for such duty. Each candidate need have only one examination properly recorded and supported by necessary supplementary studies and consultation reports.

DIVING DUTY

All personnel engaged in hyperbaric chamber duty, diving, and underwater swimming, and all candidates for such duty will conform to the physical standards set forth in MANMED Chapter 15. Results of medical examinations are recorded on SF 88 and SF 93. Every diving medical examination will be filed in the individual's health record and a copy forwarded to BUMED (Code 53) for review.

Frequency of diving medical examinations:

- Applicants—A diving medical examination (DME) is required for all candidates.
- Officer personnel—Officer DME will coincide with requirements for periodic officer examinations unless superseded by requirements listed below.
- Enlisted personnel—Enlisted DME will be conducted within 3 months of the following birthdays: 18, 21, 24, 27, 30, 32, 34, 36, 38, 40, and yearly thereafter unless superseded by requirements listed below.
- Saturation divers—Yearly DME will be required within 1 month of birthday.
- Experimental divers—All divers engaged in experimental or research diving will have a yearly DME within 1 month of birthday.

AVIATION PERSONNEL

To promote safety and to provide uniformity and completeness, an aviation physical examination will normally be performed only by a flight surgeon or an aviation medical examiner (AME) who is on active duty, currently assigned to a flight surgeon billet or aviation activity authorized by the Commander, NMPC. Aviation physical examinations may be conducted when prescribed by the proper authority of the Army or Air Force.

The object of the aviation examination is to select for aviation duty only those individuals who are physically and mentally qualified for such duty and to remove from such duty those who may become temporarily or permanently unfit because of physical or mental defects. The main objective in examining candidates for flight training is selecting individuals who can fly safely and continue to do so for at least 20 years. All present conditions or history of diseases that tend to be chronic, recurrent, or progressive will be thoroughly evaluated.

An aviation physical examination, therefore, is an examination conducted to determine whether or not a person is physically qualified and aeronautically adapted to engage in frequent aerial flights. The extent of the examination is determined by the character of the duty to be performed by the person who will make such flights.

There are several classifications of aviation personnel, ranging from naval aviator to crewmember. The extent of the examination and the physical qualifications are technically different for each classification. (See section V, chapter 15, MANMED for specific physical standards.)

Aviation personnel include all individuals who, in the performance of their duty, are required to make frequent aerial flights, and certain nonflying personnel. They are divided into two classes:

Class 1—Aviation personnel engaged in the actual control of aircraft, which includes naval aviators and student naval aviators. Included in this class are student naval flight surgeons who are chosen to perform solo flights. Class 1 is further divided into service groups I, II, and III, based on the age of the aviator concerned and certain physical requirements:

Service Group I—Aviators under 45 years of age who meet the physical standards for service group I. These aviators may be assigned to flight duties of an unlimited or unrestrictive nature.

Service Group II—Aviators under 45 years of age who meet the physical standards for service group II and aviators of service group I who temporarily meet only the physical standards for service group II. All aviators of service group II are restricted from shipboard operations in fixed wing and V/STOL aircraft.

Service Group III—Aviators 45 years of age and older who meet the physical standards of service groups, I, II, or III and those aviators under 45 years of age who are recovering from illness or injury or those who meet the standards of service group III but are not physically qualified for other service groups.

Class 2—Aviation personnel not engaged in actual control of aircraft, which includes naval flight officers, technical observers, naval flight surgeons, aviation physiologists, aviation experimental psychologists, crewmembers, flight nurses, parachute jumpers, control tower operators, air controlmen, and other persons ordered to duty involving flying.

The procedures for recording and forwarding of physical examinations are contained in current BUMED instructions and MANMED chapter 15.

FORMER MEMBERS PHYSICALLY DISQUALIFIED FOR REENLISTMENT WHEN SEPARATED

No former enlisted member who was discharged by medical survey or who at the time of last discharge was not recommended for reenlistment due to physical disability will be enlisted without authority from the Navy Department. In requesting authority for the enlistment, the medical officer will submit a complete report of notations made on the last discharge and a statement of the applicant's present physical condition, together with a request for waiver.

CANDIDATES FOR COMMISSION OR WARRANT

Instructions relative to the physical examination, physical standards, reporting procedures, and qualifications for various officer candidate programs are contained in MANMED Chapter 15 and are published periodically in the *Naval Directives System* to coincide with the particular needs of the service. These instructions are published by and correlated with the various commands and are subject to change at any time.

CANDIDATES FOR SERVICE ACADEMIES, ROTC 4 YEAR SCHOLARSHIP PROGRAMS, AND NAVAL ACADEMY PREPARATORY SCHOOLS (NAPS)

Complete procedures for administering and reporting physical examinations on candidates for service academies and ROTC 4 Year Scholarship Programs are contained in BUMEDINST 6120.3 series.

The Department of Defense Medical Review Board (DODMRB) is a DOD agency with the exclusive responsibility for scheduling and reviewing all physical examinations on candidates for the service academies and the ROTC 4 Year Scholarship Programs. Questions and problems regarding these physical examinations should be addressed to the Director, Department of Defense Medical Review Board, P.O. Box 3000, U.S. Academy, CO 80840.

All applicants for the Naval Academy Preparatory School (NAPS) will be examined in accordance with BUMEDINST 6120.3 series. Their physical examination reports are to be clearly marked "NAPS CANDIDATE." Instructions regarding application to NAPS are contained in OPNAVINST 1531.3 series.

RETIRED MEMBERS ORDERED TO ACTIVE DUTY

A member on the retired list who is ordered to active duty, except for short periods of temporary active duty, will be required to complete SF 93 (Report of Medical History) and will be physically examined by a medical officer. The medical examiner will list all defects or disabilities and express an opinion as to the type of duty the member is physically qualified to perform. The examination is recorded on SF 88 and will be accompanied by SF 93.

RESERVE COMPONENTS, NAVY AND MARINE CORPS PERSONNEL NOT ON ACTIVE DUTY

The physical standards for appointment and enlistment are the same as those prescribed for the Regular Service.

The physical standards for retention of personnel (officers and enlisted) is physical fitness to perform all the duties of grade, rate, and category to a degree that would reasonably fulfill the purpose of employment on active duty. MANMED Chapter 15 sets forth the physical standards for all categories of Navy and Marine Corps reservists. A complete physical examination is required on the following occasions:

1. Prior to appointment, enlistment, reenlistment, extension of enlistment, and promotion of officers, unless a complete physical examination was conducted within the past 12 months, in which case an entry on the SF 600 is required to certify that there has not been any significant change in the member's condition since the date of the last valid examination.

2. When not on active duty, including active duty for training in excess of 30 days, all naval reservists of the Selected Reserve and all others in a drilling status (Ready Reserve, Standby Active (S-1)) and all class II Marine Corps reservists will undergo a complete physical examination within 30 days of their birth date at age 21, 24, 27, 30, 33, 36, and annually thereafter.

3. Aviation, submarine, and diving personnel will be examined in accordance with the applicable standards in MANMED Chapter 15.

4. All other reservists not in categories 1, 2, or 3 above will be examined every 4 years or more often as deemed necessary. This examination is identified as "QUADRENNIAL" and will be entered in block 5 on SF 88 and SF 93.

5. When members are ordered to active duty or active duty for training in excess of 30 days, unless a complete physical examination was conducted within the preceding 12 months.

6. When members are ordered to training duty of 30 days or less and involuntary training duty for 45 days or less, prior to or upon reporting for such duty, unless a complete physical examination was conducted according to the periodic schedule in 2 above.

7. Upon release from active duty or active duty for training in excess of 30 days for all members of the Naval and Marine Corps Reserve. The separation physical is the same as for members of the Regular Service being separated.

Reporting Procedures

Each physical examination will be recorded on SF 88 and SF 93. For detailed procedures see MANMED Chapter 15.

When a complete physical examination is not required for active duty or active duty for training, certification of continued physical fitness will be accomplished by an entry on SF 600 and endorsement of appropriate orders.

PHYSICAL DEFECTS AND WAIVERS

A waiver of the physical standards is not required if the examiner considers the defect to be of little present or future significance and not to be disqualifying. The examiner need only record and describe the defect in the appropriate section on SF 88.

A waiver is required when a defect is considered to be disqualifying in accordance with the standards, but is of such nature as not to preclude the performance of duty. A waiver may be recommended.

A waiver is not appropriate when:

- The defect might constitute a menace or jeopardize the health, general welfare, or safety of the individual or the individual's associates.
- The defect is of such nature that the individual could not reasonably fulfill the purpose of employment.

When, in the opinion of the medical officer and the commanding officer or officer in charge of the examining facility, a waiver of the physical standards is warranted, a recommendation to this effect may be submitted on SF 88 for consideration for the following:

- Appointment or reappointment of an officer in the Navy, Marine Corps, or Reserve components.
- Enlistment or reenlistment of a member in the Navy, Marine Corps, or Reserve components.

The recommendations for a waiver of the physical standards will include all of the defects to which referred and entered on the reverse of SF 88. The words "WAIVER RECOMMENDED" will be stamped, printed, or typed in bold type on the upper-right margin above block 3 of SF 88. The commanding officer or officer in charge of the examining facility may indicate on the reverse of SF 88 approval or disapproval of the findings of the medical examiner. No change in the member's status will be made pending final action on the recommendation for waiver of the physical standards by NMPC or CMC based upon the recommendation of the Chief of BUMED.

VALIDITY PERIODS FOR REPORTS OF MEDICAL EXAMINATION

Medical examinations will be valid for the purpose and within the periods set forth below, provided there has been no significant change in the member's physical or mental condition:

- One year from the date of medical examination to qualify for induction, enlistment, and appointment as a Reserve or Regular officer, and enrollment in officer candidate programs.
- Six months from date of examination for separation from active duty, including retirement.
- Ninety days from date of examination for separation from active duty for members desiring to reenlist.

A medical examination conducted for one purpose is valid for any other purpose within the prescribed validity periods provided the examination is of the proper scope. If the examination is deficient in scope, only those tests and procedures needed to meet the additional requirements will be made and the results will be recorded.

WEIGHT CONTROL

Excess body fat is a serious detriment to health, longevity, stamina, and military appearance. Medical officers and Medical Department representatives must be alert to identify obese members and recommend preventive and remedial regimes to the commanding officer.

The commanding officer is responsible for the overall administration and enforcement of the command weight control program as set forth in BUPERSINST 6110.2, BUPERSMAN 3420440, and MCO 6100.3. Medical officers are responsible for participating in the enforcement of the weight control program and specifically for:

- Familiarizing themselves with the appropriate weight control directives.
- Monitoring and assessing body weight as a routine part of their daily contact with members at sick call and when conducting physical examinations.
- Evaluating obese and overweight members to rule out underlying or associated disease processes.
- Recommending weight reduction goals and prescribing diets and exercise programs.
- Providing the commanding officer with the names of obese members and recommending appropriate courses of action.
- Periodically reevaluating members participating in a weight reduction program, assessing their progress, and keeping the commanding officer informed of the progress in each case.

If doubt exists whether to classify a person as obese, submit front and side view photographs in bathing suit and in uniform, complete physical examination report on SF 88, and appropriate comments and recommendations from the medical officer and the commanding officer via BUMED (Code 3322) to NMPC (Code 5222) or CMC (Code MMSR), as appropriate, for consideration.

CHAPTER 10

ADMINISTRATION

Although most of the corpsman's duties are performed in a clinical environment, you may be assigned to a clerical position aboard ship or with the Fleet Marine Force where a knowledge of administrative procedures and reports is a must.

Handling, correcting, and using official directives and publications are important administrative duties. The efficiency of your office depends upon the condition of its publications and directives and the timely submission of accurate reports.

As you progress in rate and assume greater responsibility, you will be required to maintain the activity's Medical Department journal, various logs, records, and directives.

Many tasks concerning pay and personnel are now performed by computers. These computers scan vast amounts of material in less time and with far more accuracy then people can. The effectiveness of this system depends on how well you prepare, process, and transmit optical character recognition (OCR) documents.

You use Navy directives and publications increasingly as you learn your job. They are the references you turn to for information. The better you know your publications and directives, the quicker you will find the information you need.

This chapter covers medical reports, logs, and records commonly used by the Medical Department. It also instructs you on the maintenance and disposal of instructions and notices, which are part of the Navy Directives Issuance System. The last portion of this chapter is an introduction to OCR documents.

BUREAU REPORTING REQUIREMENTS

Medical Department personnel are required to submit special and periodic reports as specified in MANMED 23. One such report is the monthly Medical Services and Outpatient Morbidity Report. Instructions on preparing and submitting this report are contained in BUMEDINST 6300.2 series.

For purposes of identification and control, each report required by BUMED has been assigned a report symbol from the Department of the Navy Standard Subject Identification Codes, SECNAVINST 5210.11 series. No report is an official continuing reporting requirement of BUMED unless it bears a report symbol. This symbol is placed on all reports (letter and form) submitted to BUMED. In addition, all correspondence referring to an official reporting requirement of BUMED should cite the title and symbol of the report. Example: MED-1611-1, Professional Performance.

Only the original of each report is submitted to BUMED unless otherwise indicated. Where practicable, signatures should appear on the reports, thus eliminating the need for letters of transmittal.

The tabulation of Bureau reporting requirements in MANMED 23 lists the report symbol, the title of the report, the format, the frequency, the requiring directive, and the preparing activity.

NAVMED, SF, DD, and Other Forms, and Logs

BUMED has distributed forms to facilitate reporting, recordkeeping, and administrative efficiency throughout the Medical Department.

For the purpose of identification and control, all Medical Department forms have been assigned a letter or number. All correspondence referring to a form should cite its correct letter or number and title.

BUMED also maintains administrative control over the use of certain Standard Federal forms. These and other forms used by the Medical Department are described in MANMED 23.

Forms available for issue through the Forms and Publications Center of the Navy Supply System should be ordered from the appropriate distribution point in accordance with (IAW) NAVSUP 2002, Navy Stock List of Forms and Publications, Cognizance Symbol I. Stations should maintain a 3-month and ships a 6-month supply of forms.

NAVMED-S Binnacle List

This report is prepared by the senior representative of the Medical Department on board and submitted to the commanding officer by 0930 daily. The form contains a list of all those recommended to be excused from duty because of illness. The list must be approved by the commanding officer, and no names may be added without his or her permission.

NAVMED-T Morning Report of Sick

This report contains a list of the sick including names, diagnoses, and conditions. It is prepared by the senior representative of the Medical Department on board and submitted to the commanding officer by 1000 daily.

When it is necessary to excuse someone from duty after the Morning Report of Sick has been submitted, the patient's name is added to the binnacle list and the appropriate report is submitted to the commanding officer. If the person still is unfit for duty when the next Morning Report of Sick is submitted, his or her name is added as of the date on which the name was first entered on the binnacle list.

If a satisfactory diagnosis cannot be established, simply note "Diagnosis Undetermined (Observation)" and indicate the chief complaint. Cases of malingering are reported to the commanding officer and entered in the report book.

Register of Patients (DD Form 739 or Mechanized Listing)

Naval medical facilities providing inpatient care maintain a current register of patients. The register includes all inpatients (military, dependents, including infants born at facility, etc.) admitted to the facility.

DD Form 877, Request for Medical/ Dental Records or Information

DD Form 877 is used to request medical or dental records. When ordering health and dental records from the National Personnel Records Center, St. Louis, MO, use DD Form 877; no other form will be accepted. The form is prepared in triplicate. Forward the original and one copy of DD 877; retain the third copy.

Reports to the Officer of the Deck or Day

Injuries or death of personnel; damage, destruction, or loss of Medical Department property; and any other important occurrences are reported by the medical officer to the officer of the deck or other proper official for entry in the log or journal of the command or activity.

Patients in serious condition are reported to the commanding officer or the officer of the deck or day, together with the necessary information for notification of next of kin.

Medical Journal

Each medical activity or facility maintains a journal in which will be entered a complete, concise, chronological record of events of importance or of historical value concerning the Medical Department, other than medical histories of individuals. It lists personnel admitted to or discharged from the binnacle or sicklist; reports of personnel casualties, injuries, and deaths; inspections of fresh provisions; lectures given to nonmedical personnel and stretcher bearers; inspections of medical equipment, battle dressing stations, first-aid lockers, first-aid gun bags, and stretchers; receipt of medical supplies; and all other occasions of significance. The journal is signed daily by the medical officer, when assigned, or the Medical Department representative (MDR). The journal is a permanent record and is retired IAW SECNAVINST 5212.5 series.

Sick Call Treatment Log

A daily Sick Call Treatment Log is maintained for each ship or station. The log contains the date and time reported, the patient's name, rate, SSAN, command, division, complaint, treatment, disposition, and the time departed sick call. The log is retired IAW SECNAVINST 5212.5 series.

Statistical Data Log

The purpose of the Statistical Data Log is to provide documentary support to aid in compiling the monthly Medical Services and Outpatient Morbidity Report (NAVMED FORM 6300/1) and the annual Report of Tuberculin Retesting (MED 6224-8). Information is recorded IAW BUMEDINST 6224 series.

Training Log

All lectures and training periods that are part of the training program are to be recorded in the Training Log and the Medical Department journal.

Water Test Log

The purpose of this log is to maintain the readings of daily residual chlorine levels and the weekly bacteriological examinations required on potable water aboard ship and in the field.

Appointment Log

Medical consultations and clinical appointments are scheduled by the Medical Department and cancelled if the patient is unable to keep them.

MAINTAINING DIRECTIVES

As a hospital corpsman in an administrative billet, you may be responsible for maintaining your command's files of Navy directives. Refer to SECNAVINST 5215.1 series for complete details of your responsibilities. A directive can be an instruction (analogous to a Marine Corps order), a notice (analogous to a Marine Corps Bulletin), or a change transmittal. Directives prescribe or establish policy, organization, conduct, methods, or procedures; require action; set forth information essential to the effective administration or operation of activities concerned; or contain authority or information that must be promulgated formally.

An instruction is a directive containing authority or information having continuing reference value or requiring continuing action. It remains in effect until superseded or otherwise cancelled by the originating command or higher authority.

A notice is a directive of a one-time or brief nature, which has a self-cancelling provision and the same force or effect as an instruction. It usually remains in effect for 6 months or less, but never longer than a year. Any requirement for continuing action contained in a notice, such as submitting a report, using a form, or following a specified procedure, is cancelled when the notice is cancelled, unless the requirement is incorporated into another document.

A change transmittal is used to transmit changes to an instruction or, under extenuating circumstances, a notice. Each transmittal describes the nature of the change and gives directions for making them. In the Marine Corps comparable changes are made to orders and bulletins.

Instructions are normally placed in large three-ring binders in numerical sequence according to subject identification number. This number is in the top right or left corner of each page. Checklists of directives issued by Washington headquarters organizations are organized in this manner. If local conditions require, another filing sequence may be followed, such as by issuing authority, by a combination of subject identification number and issuing number, or by security classification. Because of their brief duration, notices ordinarily do not need to be filed in the master file. If it is necessary to file them with instructions temporarily, the notices should be tabbed so that each may be easily and promptly removed as soon as its cancellation date is reached. Copies may be filed in separate suspense binders when necessary.

When a notice or instruction must be removed from the files, a locator sheet is made up and put in its place in the binder. This sheet will have the directive's subject identification number, subject title, date removed, and both the location of the directive and the name of the persons who has custody of it.

Follow the instructions enclosed in a change transmittal to enter changes to a directive. Proper notations, such as "CH-1," are entered in the upper right margin of the first page of each directive changed (or on the record-of-changes sheet for a publication-type instruction) to indicate changes received and incorporated.

Notices are disposed of when their cancellation date is reached. Instructions are retained or disposed of as authorized in SECNAVINST 5215.5 series, Disposal of Navy and Marine Corps records.

INTRODUCTION TO OPTICAL CHARACTER RECOGNITION DOCUMENTS

This portion of the chapter presents an overview of the use of automatic data processing (ADP) in the pay and personnel systems and explains the basic procedures and techniques for preparing, correcting, transmitting, and controlling OCR data input documents.

The automated pay and personnel systems have a broad interface and operate in close coordination. The pay system, which is the Navy version of the Joint Uniform Military Pay System (JUMPS) used by all the armed services, maintains computerized leave and pay accounts, furnishes monthly leave and earnings statements (LES), and provides financial management reports to the Naval Military Personnel Command (NMPC) to support planning, programming, and budgeting needs. The personnel system, called the Manpower and Personnel Management Information System (MAPMIS), gathers, processes, stores, and disseminates personnel information required for record and management purposes, including reports to NMPC for planning and statistical use in personnel distribution, promotion, and training.

The main regulatory publications for the systems are the *Department of Defense Military Pay and Allowances Entitlements Manual,* short title: DODPM; and the *Bureau of Naval Personnel Manual* (NAVPERS 15791B), short title: BUPERSMAN. These manuals contain pay and personnel entitlements and regulations for regular and Reserve members of the Navy. They are supplemented by a procedural manual containing complete instructions for disbursing and administrative offices in the administration of pay and military personnel, namely, the *Navy Pay and Personnel Procedures Manual* (NAVSOP 3050), short title: PAYPERSMAN. PAYPERSMAN is organized in parts and chapters arranged and numbered in the same order as those of DODPM. In addition to the corresponding parts, it has a part nine containing detailed instructions for the preparation and distribution of documents used in the automated pay and personnel systems, together with illustrations of properly completed documents. You will need to refer to the above publications often in working with JUMPS or MAPMIS.

COMPUTERS AND OCR DOCUMENTS

The principal computer installation for personnel information is located at NMPC in Washington DC, and the one for pay at the Navy Finance Center (NAVFINCEN) in

Cleveland. NMPC and NAVFINCEN exchange data daily, so you normally need to report an event only once to the appropriate central processing site to update both a member's personnel record and his or her pay account. Thus, you report occurrences that are primarily personnel-related (e.g., when a member is advanced in rate or extends his or her enlistement) to NMPC, which extracts the necessary data and passes it on to NAVFINCEN. Similarly, you report events primarily related to pay (e.g., when a member takes leave or gains or loses a dependent) to NAVFINCEN, which passes any needed personnel data to NMPC.

To report information into the automated pay and personnel systems, you use specially designed forms. These are completed as typewritten documents on an OCR typewriter having specially shaped letters and numerals. The information in the documents is transferred directly to the computers for processing by scanners that read the optically recognizable characters from the typewritten copy and convert them into computer code on magnetic tape. Each of the several scanners at NMPC and NAVFINCEN can read 370 characters per second, or 750 documents an hour, and simultaneously edit the documents, rejecting any unacceptable ones. This OCR method of direct computer input is much faster and more accurate than older methods of feeding information into computers by punched cards or punched paper tape, because it eliminates the time-consuming transcription of source data to cards or paper tape. It also reduces errors at the computer site.

ROLE OF ADMINISTRATIVE PERSONNEL

PAYPERSMAN prescribes procedures to be used by administrative, or admin, offices.This nomenclature is used as an inclusive term for the sake of brevity. Wherever the words "admin office," or "adminstrative office," are used in this chapter, they may be applied to administrative, personnel, or executive offices, which are responsible for preparing input documents and maintaining personnel records.

Administrative personnel play a vital role in making the automated pay and personnel systems work effectively. When you are assigned to admin office duties, you perform a key function by preparing documentation for such actions as advancement, leave, punishment, reenlistment, separation, and transfer. For your shipmates and yourself to receive efficient financial and personnel services, personnel actions must be reported correctly and promptly. Indeed, success of the systems depends directly on the accuracy and completeness of the data submitted in the OCR input documents, the quality of their preparation, and the timeliness of their submission.

The requirement for precise preparation applies to both typing and correctness of the reported data. Either kind of error can foul up the systems. For example, if in typing an OCR document you align it improperly, strike over, or erase, the scanner will reject it as a document error. Unless a rejected document can be corrected at the central processing site without change in content, it must be returned to the preparing activity for correction or retyping. The time spent in transmitting and returning the document is wasted and accomplishment of its intended purpose delayed. The second type of error may be even more serious. If you report inaccurate information—e.g., show a wrong date or amount—the faulty data may be accepted by the scanner and processed, resulting in incorrect personnel records, pay accounts, or both. By eliminating errors at the source, you can reduce the number of rejected documents and avoid the introduction of erroneous data into the systems.

When an incorrect OCR document is forwarded to NMPC or NAVFINCEN, the preparation and submission of a second document is required to correct the error. Moreover, the original error may already have been fed into the system, where it may affect the member's advancement, assignment, or pay through at least one pay period. In short, make sure all documents are correct when they leave your office.

Remember, the two primary requirements are accuracy and timeliness, and they are

Table 10-1.—OCR Data Input Documents

Copies	FORM	Initiated by	Transmitted to Central Site Operator by[1]	Copies Exchanged Between AO & DO
NC 3051	Transmittal Letter	DO or AO[2]	DO or AO[2]	No
NC 3052	Employees Withholding Exemption Certificate	DO	DO	No
NC 3053	Allotment Authorization	DO	DO	No
NC 3055	Military Pay Voucher	DO	DO	No
NC 3056	Military Payroll Money List	DO	DO	No
NC 3057	Family Separation Allowance	AO	DO	Yes
NC 3058	Family Separation Allowance (Multiple)	AO	DO	Yes
NC 3059	Conversion Pay Record	DO	DO	No
NC 3060	Military Pay Order (Single)	AO or DO[3]	DO	[3]
NC 3061	Military Pay Order (Multiple)	AO or DO[3]	DO	[3]
NC 3062	Orders for Hazardous or Special Duty	AO	DO	Yes
NC 3063	Overseas Station Allowances	AO	DO	Yes
NC 3064	Basic Allowance for Subsistence	AO	DO	Yes
NC 3065	Leave Authorization (Officer & Enlisted)	AO	DO	Yes
NC 3066	Uniform Allowance Claim	AO	DO	Yes
NC 3067	Detaching (Departing) Endorsement to Orders	AO	DO	Yes
NC 3068	Reporting (Arrival) Endorsement to Orders	AO	DO	Yes
NC 3069	Detaching/Reporting Endorsement to Orders—Group Travel Listing	AO	DO	Yes

[1] The disbursing office (DO) always transmits to NFC, Cleveland; the administrative office (AO) will always transmit to NMPC.

[2] The NC 3051 is used as a cover letter for documents sent by both DOs and AOs. The forwarding office prepares and routes the NC 3051 between the administrative and disbursing offices.

[3] The NC 3060 and 3061 are usually prepared by the AO. However, before JUMPS is fully implemented, they may be prepared by the DO for reasons, such as reporting payments of LSL, correcting leave balances, and reporting nonreceipt of an LES.

Table 10-1.—OCR Data Input Documents—Continued

Copies	FORM	Initiated by	Transmitted to Central Site Operator by	Copies Exchanged Between AO & DO
NP 1070/601	Immediate Reenlistment Contract	AO	AO	Yes
NP 1070/621	Agreement to Extend Enlistment	AO	AO	Yes
NP 1070/622	Assignment to and Extension of Active Duty		AO	Yes
NP 1070/602	Dependency Application/Record of Emergency Data	AO	DO	Yes
NP 1070/606	Record of Unauthorized Absence	AO	AO	Yes
NP 1070/607	Court Memorandum	AO	AO	Yes
NP 1070/610	Record of Personnel Actions	AO	AO	Yes

critical. It is up to you to submit appropriate OCR documents as events occur in order to provide input for continuous and correct updating of the computerized records at NMPC and NAVFINCEN.

Most administrative offices are being brought under the central control of a Pay/Personnel Administrative Support System (PASS) office, which will prepare documents for input, relieving the administrative office corpsman of some document preparation responsibilities.

OCR DATA INPUT DOCUMENTS

OCR data input documents for the pay and personnel systems are prepared by field activities on forms sponsored by NMPC (NAVPERS forms) and by the Office of the Comptroller of the Navy (NAVCOMPT forms) as listed in table 10-1. Most of these documents, including all of those on NAVPERS forms and a majority of the ones on NAVCOMPT forms, are prepared by the admin office and the rest by the disbursing office, as indicated in the table by the letters "AO" and "DO."

Most OCR data input documents, including those prepared in the admin office, are explained and illustrated in DODPM, BUPERSMAN, and PAYPERSMAN.

OCR Nomenclature

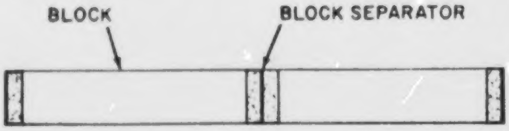
Become familiar with the terms defined below; they are part of the OCR language.

DENSITY—The degree of darkness of typed characters. The density of a scannable page should be uniform and the print sharp and shadow-free. When you have dark letters next to light ones, you do not have uniform density—e.g., NOT UNIFORM.

MISALIGNMENT—The printing of one or more characters or words out of line, usually high or low. This sometimes appears as a HIGH OR LOW WORD.

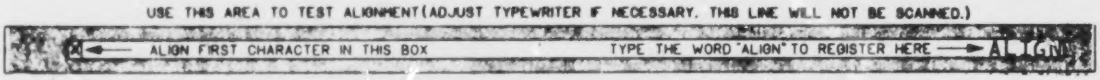
SKEW—The tilting of a character or line of typing, both of which are unacceptable. In the word TILT the L is skewed. In line skew the typed line runs uphill or downhill in relation to the top edge of the paper.

BLOCKS—Areas for data formed by dividing a line by one or more block separators, as shown below.

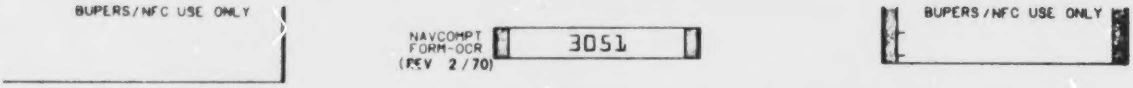

BLOCK
BLOCK SEPARATOR

DROPOUT BLUE AREAS—The light blue areas outlining those portions of an OCR form that will be read by the scanner. You must type inside the lines and block boundaries, never in the blue shaded areas at the ends of lines or between blocks. Any character, even a delete symbol (described later in this chapter), typed in a dropout blue area will cause the scanner to reject the document. In the scannable part of an OCR form, two horizontal lines and the gray shaded areas in the preceding illustration, as well as the block captions, which are not shown, are printed in dropout blue to provide visual guidance for the typist and reviewers. The blue color is used because it is not readable by the scanners.

ALIGNMENT TAB—The tear-off portion at the top of each form, used in aligning it to prevent line skew. This tab, shown below, is removed before you transmit the document.

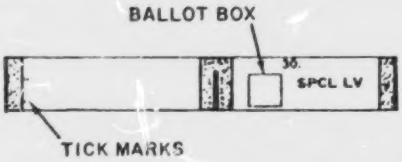

USE THIS AREA TO TEST ALIGNMENT (ADJUST TYPEWRITER IF NECESSARY. THIS LINE WILL NOT BE SCANNED.)
X ← ALIGN FIRST CHARACTER IN THIS BOX
TYPE THE WORD "ALIGN" TO REGISTER HERE → ALIGN

HEADER LINE—The line containing the preprinted OCR program number and usually two blocks for scanner use only, as illustrated below.

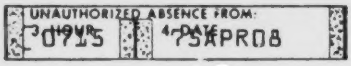

BUPERS/NFC USE ONLY
NAVCOMPT FORM-OCR (REV 2/70)
3051
BUPERS/NFC USE ONLY

TRANSMITTAL LETTER

TARGET AREAS—The areas in which information is to be typed. Two kinds of guide marks for the typist are shown below.


BALLOT BOX
36.
SPCL LV
TICK MARKS

Type an X in a ballot box when the information in the block caption is applicable in a particular case. You must align all typed entries between the two tick marks at the left margin of the scannable lines. This may result in typed characters covering the bottom line of a two-line block caption in dropout blue, as shown below, but they will nevertheless be read by the scanner. Incidentally, note also from the illustration below that calendar dates are entered on OCR documents in seven characters without intervening spaces, using two figures for the year, a three-letter abbreviation for the month, and two figures for the day.



UNAUTHORIZED ABSENCE FROM:
3-HOUR 0715
4-DAY 75APR08

PREPARING, HANDLING, AND MAILING OCR DOCUMENTS

Forms

OCR documents are prepared on forms printed in carbon-interleaved sets. Each document set serves both automation and record purposes. The original copy is for scanning. The carbon copies in the set satisfy various record requirements, such as file copies for the officer or enlisted service record folder and for the originator and other offices as needed.

See the illustration of a typical OCR document in figure 10-1. On an actual form most of the original scanner copy is printed in dropout blue; the carbon copies are printed in black.

Typewriter and Ribbon

The typewritter you use to prepare an OCR document must have an American Standards Institute OCR type font with 10-pitch spacing. The OCR scanners the Navy currently uses read uppercase letters, arabic numerals, punctuation, and certain symbols. They cannot read lowercase alaphabetic characters; therefore, these are not used in typing the scannable portions of documents.

Carbon ribbons must be used for OCR typing; fabric ribbons do not provide adequate and consistent density.

Care of Typewritters

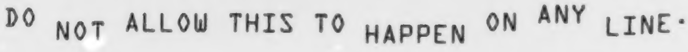
OCR typewriters must be kept clean and in good repair at all times. A typewriter that is dirty or out of repair, or has dirty type faces, will produce dirty documents or poor print quality that will be misread or rejected by the scanner. By checking and cleaning your typewriter each day before use, you can prevent the high document reject rate that a dirty or improperly maintained typewriter will cause. Always keep your typewriter covered when not in use.

CENTERING AND ALIGNING THE PAPER

Centering the paper in the carriage helps to maintain the accurate line spacing required in typing OCR documents. Insert the paper so its right and left edges are approximately equidistant from the right and left ends of the platen.

The paper must be aligned very carefully to prevent line skew that will cause the scanner to reject the document. Align the form so it is in position for typing an X exactly in the box on the left side of the alignment tab and at the same time for precisely overtyping the word ALIGN on the right side. Then test the alignment by typing the test letters in the indicated areas of the tab line. Realign the form if necessary, making sure the X is inside the box and the typed word ALIGN is in the white area of the tab line before proceeding.

After the paper is aligned, set the left margin on the X box in the tab line. Begin typing in the extreme left space of each block. Never allow the typing to touch the top or bottom line in any block or the dropout blue area at the ends of lines or between blocks, as this will cause the scanner to reject the document. On some multicopy forms you may find the typing falling low in the blocks. Use the variable line-spacing control on the platen as necessary to keep the lines of typing falling within the alignment tick marks at the left margin. However, any such adjustment must be made before you start typing a line to avoid misalignment of the type shown below, which will result in rejection by the scanner.



DO NOT ALLOW THIS TO HAPPEN ON ANY LINE.

Signatures

Take special care to ensure that signatures are kept within the signature blocks. An otherwise valid document will be rejected if any part of a signature extends over the boundary of the target area into another block that is to be scanned. Also, a signature on the back of a document extending outside the signature block may show through the paper in a scannable area on the front side and cause rejection.

Checking Documents

Review each document before submission to ensure it is proper and correct. You can avoid or considerably reduce erroneous and duplicate submissions and the transmitting of documents containing such common errors as:

- Missing signature
- Date of preparation blank
- Hyphens missing after the third and fifth digits of a Social Security number
- Lowercase L {l} used for numeric one {1}
- Alphabetic O used for numeric zero {0} or vice versa—e.g., officer pay grade incorrectly shown as 03 vice O3
- Lowercase alphabetic character in any scannable area
- Invalid abbreviation—i.e., an abbreviation other than those specifically authorized in PAYPERSMAN
- Conflicting or invalid dates—e.g., an effective date for a reported action indicating it has not yet occurred
- Time miscalculation—i.e., improper accounting for elapsed time
- Document submitted to correct a previously reported action not identified as a "corrected copy"

Handling and Mailing

Use care in handling and mailing OCR forms and documents. Dirt or damage can either cause a character to be misread as incorrect data sent to the computer or, more likely, cause the document to be rejected by the scanner. Forms should be stored in a clean, dry place and kept in a flat position to avoid damaging the edges. Avoid fingerprints on the documents, and remove alignment tabs and carbons carefully so as not to smudge the characters to be scanned.

In all cases, OCR data input documents should be airmailed daily or, from ships under way, be placed in the mail daily for airmailing at the earliest opportunity, under a letter of transmittal. Do not use certified or registered mail as this would slow down the process. Documents should be submitted not later than the day following the day of occurrence of the reported events, provided operational circumstances permit. Assemble the transmittal with the documents flat and face up and the transmittal letter on top. Special reinforced mailing envelopes are used to prevent folding or otherwise damaging the contents.

More than one transmittal may be mailed in the same envelope provided the documents are not crowded enough to damage them. Do not staple, clip, bind, tie, or otherwise fasten the documents together. Never transmit a document that has been torn, damaged on the edge, creased, folded, smudged, stained, or erased, or that contains staple holes or auditing pen or pencil marks.

Correction of OCR Documents

You cannot erase on OCR documents; nor should the correcting feature built into some typewriters be used on them. Instead, special delete symbols, described below, are used for correcting errors if there is room and the nature of the document permits. Do not hesitate to use this correction where appropriate; it is expeditious and economical, saving time and relatively expensive OCR forms. Never make a document uncorrectable by circling or otherwise marking an error; possibly the normal correction techniques can be used and the document will not have to be retyped. In using delete symbols on previously typed documents, careful alignment with the original typing is essential for scanner readability.

Character Delete

The Christmas tree {‡} and the blob {■} are both used as character delete symbols. Either of them, when typed over the character to be deleted, deletes both the character and the space the character occupied—e.g., `YEOAN` is corrected `YEO‡‡MAN`. The scanner will read `YEOMAN`. As many character deletes may be used in a block as will fit into it. Such corrections are the only strikeovers permitted in OCR typing. The character delete may be used on any OCR document.

Block Delete

The chair {⑁} is the block delete symbol. It may be typed anyplace in the block where there is a space—e.g., `YEOMAN⑁` —whereupon the scanner will read the block as blank. The block delete is not used on documents whose copies are filed as service record pages since such corrections may not be readily apparent to record users.

Line Delete

The hook {⑀} and the elongated hyphen {—} are both used as line delete symbols. The hook is usually typed at the end of the line; but if there is no space at the end of the line, it may be used anyplace on the line where there is a space. The elongated hyphen is typed over the first three characters or spaces in a line. Either symbol deletes the entire line of information.

Examples:

`THIS LINE IS DELETED.⑀`

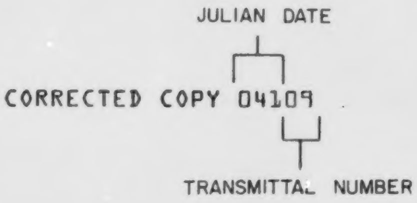
`~~THIS~~ LINE IS DELETED`

The scanner will read each of the two preceding lines as blank. If the hook appears in any block of a line divided by one or more block separators the scanner will read the entire line as blank. The line delete is not used on service record pages.

Correcting Returned Documents

Documents that are lost or returned for correction because of typing errors, unidentifiable characters, incorrect format, invalid entries, or form damage are corrected or retyped as necessary and resubmitted promptly. If the original is available and the erroneous document can be corrected by adding or deleting entries, gather all locally available copies of the document (from the suspense file, service record, disbursing office, etc.) and enter the correct information thereon. Otherwise the erroneous or lost document must be retyped. Whenever a document is corrected by retyping, recover and destroy all available copies of the erroneous document.

If a document that has been transmitted to NMPC or NAVFINCEN is subsequently corrected or retyped, the corrected document is annotated in the middle of the bottom margin as a corrected copy with an indication in five digits of the three-figure Julian date and the two-figure transmittal number of the original transmittal (both explained later in this chapter).



Always include such citation of the original transmittal in "corrected copy" annotations. No annotation is made on a corrected document when an error is detected and corrected before the original has been forwarded to NMPC or NAVFINCEN. Corrected documents resubmitted to NMPC are forwarded in a separate transmittal as group VI documents (explained later in the section of this chapter dealing with transmittal letter preparation).

Transmittal of OCR Documents

All original OCR data input documents—always transmitted to NMPC by admin offices and to NAVFINCEN by disbursing offices—are forwarded under cover letters prepared with an OCR typewriter on NAVCOMPT Form 3051, Transmittal Letter, which is a four-part set. This document is illustrated in figure 10-1. Input documents on NAVCOMPT forms are scanned at NAVFINCEN and those on NAVPERS forms at NMPC, with the exception of NAVPERS 1070/602, Dependency Application/Record of Emergency Data, the original copy of which is transmitted by the disbursing office to NAVFINCEN for scanning. The personnel office should never forward scannable documents to NAVFINCEN; those to be so scanned are submitted to the local disbursing office for transmittal.

Preparation Of Transmittal Letter

Instructions for preparing the scannable transmittal letter to accompany OCR documents sent to NMPC are contained in part nine, chapter 4 of PAYPERSMAN. Relate the essential provisions below to the form illustrated in figure 10-1.

Block 1, UNIT ID NUMBER—Enter the five-character unit identification code (UIC) for your activity. These UICs are unique activity identification numbers assigned by the Comptroller of the Navy to all Navy activities and to most nonmilitary and non-Navy military activities to which Navy members on active duty are attached. The numbers are listed in volume 2, chapter 5, of the Navy Comptroller Manual (NAVSO P1000), short title: NAVCOMPTMAN. All OCR documents must contain a UIC. For nonmilitary and non-Navy military activities without an assigned UIC, code 30001 is used; but never use this multipurpose UIC for a Navy activity. If you cannot find the UIC for a Navy activity, telephone or write the Navy Accounting and Finance Center, Washington DC, for assistance. Navy schools have two UICs: one for the staff and one for students. In the case of a member assigned to a school for training, be sure to use the school's student UIC—not the UIC for the staff or the UIC for the entire training command. The importance of using the correct UIC cannot be overemphasized; on some input documents this number is the only identification of the member's location.

Block 2, DSSN—Enter the four-digit disbursing station symbol number of the disbursing officer who provides pay service for your activity. This number appears on each leave and earnings statement.

Block 3, JULIAN DATE—Enter in three digits the Julian date on which the transmittal letter is prepared, adding zeros to the left as required to make three positions. The Julian date is the cumulative day of the calendar year—e.g., 10 February is Julian date 41 and would be entered as 041. Julian dates are shown on Government-issued calendars.

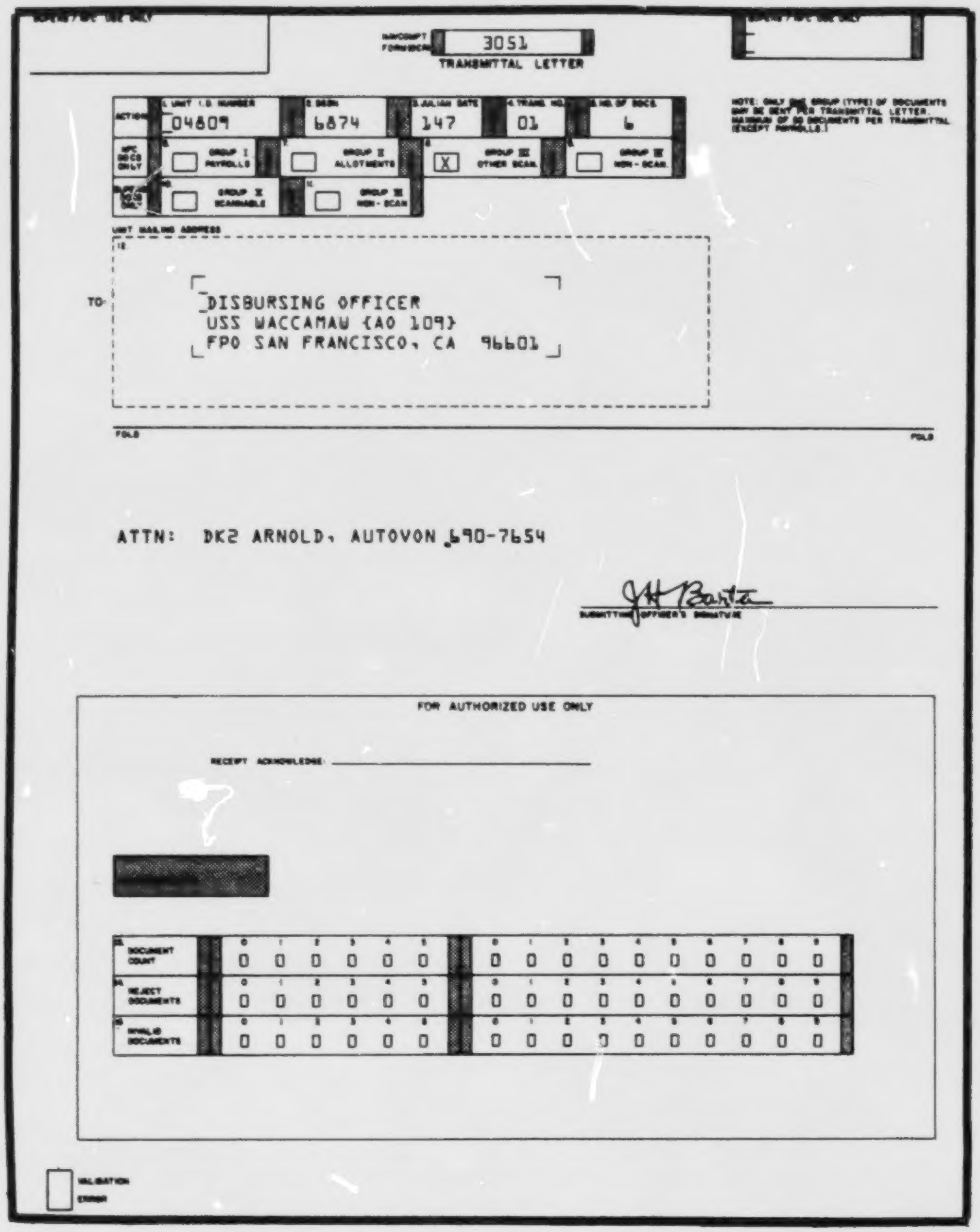
Block 4, TRANS. NO.—Enter in two digits the sequential number of the transmittal. Transmittal numbers start with 01. When the number of transmittals exceeds 99, restart with 01. This numbering system is used without regard to calendar year, fiscal year, month, or change in admin officers.

Block 5, NO. OF DOCS—Enter in one or two digits the number of documents in the transmittal. Do not count the transmittal letter. The maximum number of documents for any transmittal is 50; if you have 51, prepare two transmittal letters—one for 50 documents and another for one document.

Blocks 6 through 9—Leave blank, these blocks are used only by disbursing offices.

Block 10, GROUP V SCANNABLE—Type an X in the block if scannable documents are being initially submitted to NMPC. If an X appears in this block, then blocks 6 through 9, and 11 will be blank.

Each individual transmittal is limited to documents in a single one of six categories: groups I through IV apply to documents forwarded to NAVFINCEN by disbursing offices; group V consists of scannable documents and



NAVCOMPT FORM 3051

TRANSMITTAL LETTER

ACTION	1. UNIT I.D. NUMBER 04809	2. DSSN 6874	3. JULIAN DATE 147	4. TRANS. NO. 01	5. NO. OF DOCS. 6
NFC DOCS ONLY	☐ GROUP I PAYROLLS	☐ GROUP II ALLOTMENTS	☒ GROUP III OTHER SCAN.	☐ GROUP IV NON-SCAN.	
	☐ GROUP V SCANNABLE	☐ GROUP VI NON-SCAN			

NOTE: ONLY ONE GROUP (TYPE) OF DOCUMENTS MAY BE SENT PER TRANSMITTAL LETTER. MAXIMUM OF 50 DOCUMENTS PER TRANSMITTAL (EXCEPT PAYROLLS.)

UNIT MAILING ADDRESS

TO:

DISBURSING OFFICER
USS WACCAMAW (AO 109)
FPO SAN FRANCISCO, CA 96601

FOLD

ATTN: DK2 ARNOLD, AUTOVON 690-7654

JH Bartz
SUBMITTING OFFICER'S SIGNATURE

FOR AUTHORIZED USE ONLY

RECEIPT ACKNOWLEDGE: ______________________

DOCUMENT COUNT	0	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9
REJECT DOCUMENTS	0	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9
INVALID DOCUMENTS	0	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9

☐ VALIDATION ERROR

6.59

Figure 10-1.—Transmittal letter to NMPC.

group VI of nonscannable documents sent to NMPC by admin offices. Group VI documents are processed manually. Corrected documents are submitted to NMPC in group VI for manual processing; because they require special handling, never send them in the same transmittal with regular documents. The scanner cannot read the "corrected copy" annotation at the bottom of the page; therefore, the computer will not recognize the corrected document as such and it may be rejected as a duplicate of the erroneous document originally submitted.

Block 11, GROUP VI NON-SCAN—Type an X in the block if nonscannable documents are being forwarded to NMPC. If an X appears in this block, then blocks 6 through 10 will be blank. Nonscannables include corrected documents and any other documents or forms specifically required by manuals or directives. Do not use the OCR transmittal letter to submit nonprescribed documents such as service record pages and closed service records to NMPC.

Block 12, SENDER'S ACTIVITY ADDRESS—Enter the address of your activity in three or four single-spaced lines. The first line will read either `COMMANDING OFFICER` or `OFFICER IN CHARGE` and should be aligned on the tick marks in the box. In a four-line address the last line will fall below the two bottom address guide marks printed in dropout blue on this form, but this is acceptable. U.S. Postal Service two-letter state abbreviations, listed in appendix B of PAYPERSMAN, are used in OCR documents.

SUBMITTING OFFICER'S SIGNATURE—The personnel officer or an authorized assistant signs the original copy on this line.

In the blank area to the left of the submitting officer's signature, type the officer supervisor's name and AUTOVON or commercial telephone number, as shown in figure 10-1.

RECEIPT ACKNOWLEDGED—Leave blank; this line is not used.

Blocks 13 through 15—Leave blank; these are for NMPC use only.

Distribution Of Transmittal Letter

The original and first two carbon copies of the scannable transmittal letter accompany each submission of OCR documents to NMPC. The third carbon copy is filed with the retained copies of the transmitted documents. NMPC will acknowledge receipt by returning a copy of the transmittal letter and a document control listing (DCL), described below.

Local Transmittal Letters

For transmitting OCR documents between their offices, admin and disbursing offices use locally prepared forms. Figure 10-2 shows such a form for admin office use. Local transmittal letters are forwarded in duplicate, with the copy being returned in acknowledgement if the transmittal is correct.

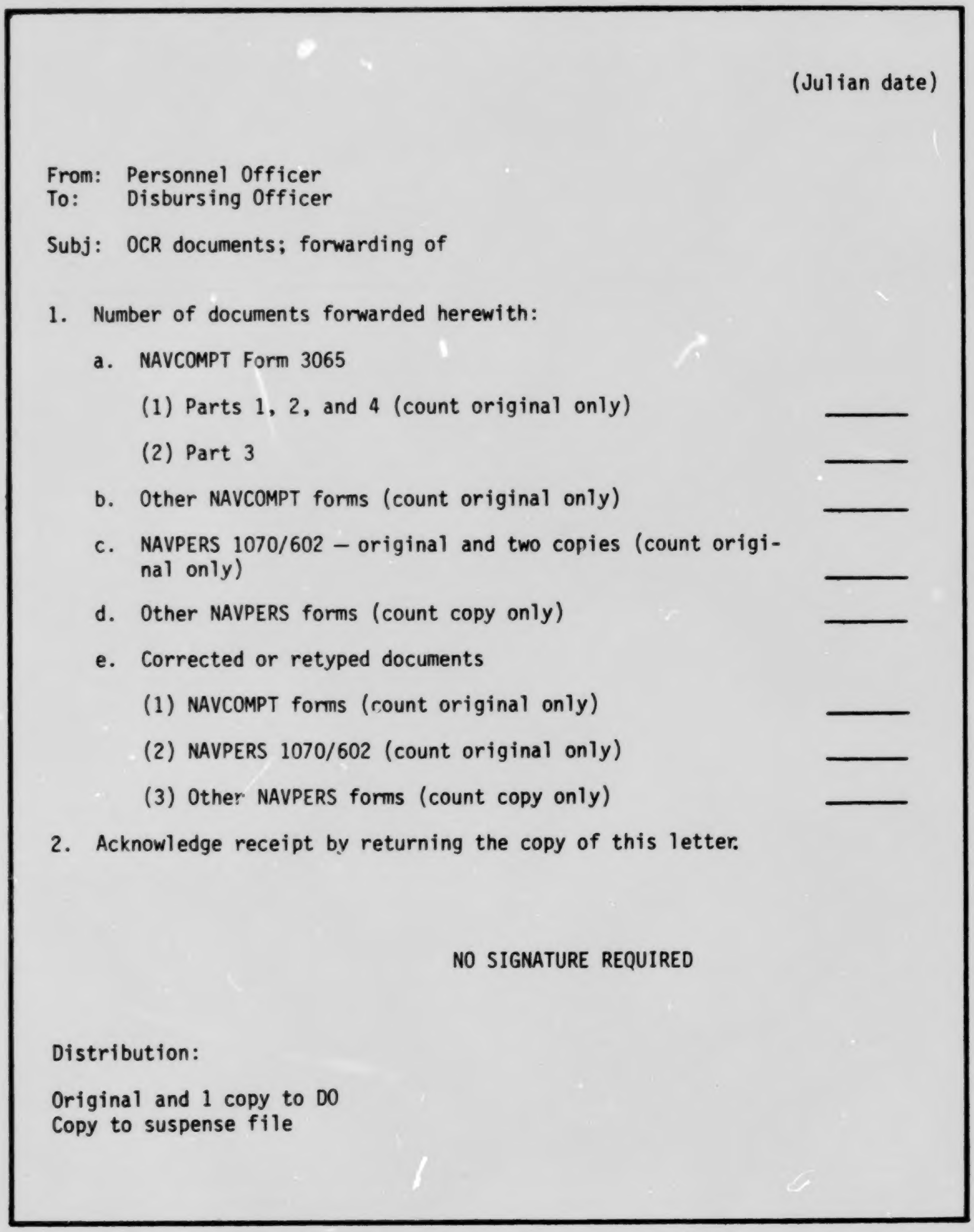
OCR Document Control Procedures

Suspense Files

The admin office keeps two OCR suspense files. One contains the retained copies of input documents sent to NMPC, along with copies in chronological order of the scannable transmittal letters that accompanied them, and the DCLs received from NMPC. The other consists of the retained copies of documents sent to the disbursing office, together with the acknowledged copies of the local transmittal letters in chronological order. The suspense files provide a record of documents submitted and facilitate the verification of automated reports received. Material in these files may be destroyed after 60 days if no followup action is required.

Document Control Listing

The DCL is furnished by NMPC on receipt of each transmittal of OCR documents. The DCL, which lists all the documents in the particular transmittal, serves to verify the number of documents received, to indicate any errors in them, and to provide the identifying document serial number assigned to each document by NMPC for use in any future reference to the document.



(Julian date)

From: Personnel Officer
To: Disbursing Officer

Subj: OCR documents; forwarding of

1. Number of documents forwarded herewith:
    - a. NAVCOMPT Form 3065
        - (1) Parts 1, 2, and 4 (count original only) ________
        - (2) Part 3 ________
    - b. Other NAVCOMPT forms (count original only) ________
    - c. NAVPERS 1070/602 — original and two copies (count original only) ________
    - d. Other NAVPERS forms (count copy only) ________
    - e. Corrected or retyped documents
        - (1) NAVCOMPT forms (count original only) ________
        - (2) NAVPERS 1070/602 (count original only) ________
        - (3) Other NAVPERS forms (count copy only) ________
2. Acknowledge receipt by returning the copy of this letter.

NO SIGNATURE REQUIRED

Distribution:

Original and 1 copy to DO
Copy to suspense file

Figure 10-2.—Local transmittal letter from personnel to disbursing.

Contents of DCL

The document serial number column in the DCL shows, for each document listed, the 12-digit number printed in the document's upper left corner, as it passes through the scanner. This number must be used in any correspondence to NMPC concerning a particular document. The beginning field number column in the DCL is applicable only to multientry documents reporting actions on more than one member. This number identifies the first block of an entry having one or more errors; other entries in the same document not so identified have processed correctly and should not be resubmitted. The form number column in the DCL shows the OCR program number that is preprinted in the top center of each form. This number often resembles, but should not be confused with, the NAVPERS form number. An error shown as informative in the type of error column in the DCL does not invalidate the document—i.e., the reported date is accepted into the system nonwithstanding the error. However, such an error may require followup correspondence from NMPC—e.g., where a document is unsigned. The error messages used in the error description column in the DCL are listed in table 10-2. Several of these messages are for NMPC in-house action only and will not be meaningful to field activities. The transmittal letter is always listed in the DCL as the first document scanned, but it is not included in the total OCR count of documents processed appearing in the summary line at the bottom of the DCL.

Verification of DCL

When a DCL is received, promptly verify it against the suspense file and take any indicated corrective action. Upon completing verification, file the DCL with the retained copy of the transmittal letter in the suspense file.

DISCREPANCIES IN DOCUMENT COUNT—The first step in verification is to match the OCR processing count shown in the DCL with the document count in the transmittal letter. If the two counts do not agree or if document errors are listed in the DCL, proceed as described below.

Admin Office Miscounted—If the document count in the transmittal letter was wrong and the DCL agrees with the suspense file, note the proper count on the retained copy of the transmittal letter.

Original Not Forwarded—If the DCL shows fewer documents than those on file and if the original of a document was not forwarded, remove the original and copy of the document from the suspense file; correct the document count on the retained copy of the transmittal letter; include the original document in the current day's transmittal; and refile the copy of the document with the retained copy of the new transmittal letter.

Original Missing—If the DCL shows fewer documents than those on file and if the original of a document is missing, remove the copy from the suspense file; correct the document count on the retained copy of the transmittal letter; retype the document, annotating it as a corrected copy; and destroy the old retained copy of the document. Forward the original retyped document in the current day's transmittal, file a copy in the suspense file, and destroy all other copies of the retyped original.

ERRORS IN DOCUMENTS—The DCL shows the errors both in erroneous documents corrected by NMPC and in those returned for correction or retyping and resubmission. Returned documents that failed scanning may accompany the DCL; those that passed scanning but contain other errors may be returned by separate correspondence.

Erroneous Documents Corrected by NMPC—For errors listed in the DCL that were corrected by NMPC, identify the correct entries and take precautions to ensure that future documents are correct.

Erroneous Documents Returned—On identifying an error in a returned document, retrieve all available copies of the incorrect document and correct or retype the document as necessary, annotating it as a corrected copy. If retyping is required, destroy all copies of the erroneous document. Forward the original corrected or

Table 10-2.—Error Messages Used in Document Control Listings

MESSAGE	EXPLANATION
NONSYSTEM DOCUMENT	Document is an obsolete version or it is not a NAVPERS OCR form.
NO SIGNATURE	Document unsigned or signed in wrong place; may be returned to activity for signature.
BLANK	Block is blank but should contain an entry.
TOO FEW CHARACTERS	Block does not contain minimum number of characters.
NOT NUMERIC	Block contains alphabetic or other characters that should be numeric.
NOT ALPHA	Block contains numeric or other characters that should be alphabetic.
NO CROSS-CHECK	Block requires an entry relative to another block but is blank; or block should be blank relative to another block: or a required relationship between the data in these two blocks is not met.
INCORRECT ENTRY	Entry does not conform to procedures.
INVALID DATE	Block contains an invalid date.
INCORRECT CHARACTER	Block for one-character entry contains the wrong character.
LOST TIME ERROR	Block contains a lost time or leave miscalculation.
TOO MANY CHARACTERS	Block contains more than the maximum number of characters.
INACTIVE STATUS	Member is not on active duty (if member was on active duty, submit a new form). An informative error.
NOT BLANK	Block should be blank but is not.

retyped document in the current day's transmittal and distribute the copies as in the initial submission.

DCL in Error—If close comparison of a returned document with the DCL reveals no error in the document, annotate a reproduced copy of the DCL to indicate the error in the listing and return both the annotated copy of the DCL and the original document to NMPC in a separate OCR mailing envelope without a transmittal letter.

Member Transferred—If an erroneous document is returned with the DCL after a member has been transferred, forward the document and a reproduced copy of the DCL to the member's new command for corrective action and resubmission of the document.

Nonreceipt of DCL

If a DCL acknowledging a transmittal has not been received within 10 days plus estimated mailing time, prepare a copy of the unacknowledged transmittal letter, mark it "TRACER COPY," and mail to NMPC in an envelope separate from the daily transmittals. On receiving the tracing copy, NMPC will notify your activity whether or not the transmittal was received. If it was not, resubmit the documents.

Error Feedback from NAVFINCEN

Error feedback from NAVFINCEN on data input to the pay system normally comes to the admin office through the local disbursing office. Erroneous documents returned by NAVFINCEN must be corrected or retyped and resubmitted promptly to the disbursing office for transmittal.

Verification of Automated Reports

Data input to the pay and personnel systems is reflected in various automated reports furnished to field activities. Two important ones received by the admin office are the Enlisted Distribution and Verification Report (NMPC Report 1080-14) and the Officer Distribution Control Report (NAVPERS 1301/5), both described in the chapter of the ***HM 1 & C*** manual on MAPMIS. Automated reports received must be checked to verify that the information submitted from the field has been properly recorded. When an event reported to NMPC by an OCR document whose receipt has been acknowledged is not reflected in the automated reports within 60 days of submission, send a tracer letter to NMPC, explaining the circumstances and enclosing a copy of the document in question. Include the member's name and SSN, the form number of the document, the transmittal date and number, and the document serial number shown in the DCL.

Documents Erroneously Transmitted

On discovering that an improper OCR document has been submitted to NMPC, report and explain the erroneous submission by speedletter or message and request removal of the information contained in the document from the member's service record and from the automated personnel system. Identify the document by form number, transmittal date and number, document serial number (if available), and the member's name and SSN. Use a message only if it is necessary to prevent hardship to the member or to protect the Government's interest. File a copy of the speedletter or message in the member's service record with the copy of the document. If an improper or erroneous document is submitted to NAVFINCEN, the disbursing office will request that the information be removed from the Military Member's Pay Account (MMPA) and file a copy of the speedletter or message request in the retained transmittal file with the copy of the document.

It is necessary to distinguish between improper and incorrect documents. Improper documents are those documents that should never have been submitted in the first place. Incorrect documents should be corrected and included in the MMPA. The proper procedure to correct a document previously submitted is to retype it with the correct information, annotate it as a corrected copy, and resubmit it.

Scannable Document Found In Service Records

If a scannable document is found in the service record of a member reporting aboard, verify its appropriateness and, if it is correct, forward the original to NMPC or the disbursing office in your daily transmittal. Mail the suspense copy to the preparing activity, distribute any other designated copies, and retain a reproduced copy in your suspense file.

CHAPTER 11

PREVENTIVE MEDICINE

The old adage "An ounce of prevention is worth a pound of cure" is an excellent guide to modern preventive medicine practice and certainly holds true in the Navy, where we are interested in keeping a man on the job rather than on the sick list.

No matter what duties hospital corpsmen are assigned to, a phase of their work will always be aimed at preventing injury and disease and improving the health of their shipmates. This chapter will familiarize you with the basics of preventive medicine and help you understand the principles of maintaining good health in everyday living.

Personal Hygiene. Personal hygiene promotes health and prevents disease. Some military people tend to be lax in paying strict attention to their personal hygiene. As a corpsman you will be responsible for recognizing signs of neglect, either at sick call or in the performance of your duties as a Medical Department representative and petty officer. You must also be especially scrupulous in your own personal hygiene, both to set a good example and to prevent the acquisition or spread of illness from patient to patient and to yourself.

Corpsmen are responsible for presenting health education training programs to the personnel of their unit. In addition to stressing the basics of personal hygiene, they must draw attention to proper foot care, exercise, and sleep as important factors in maintaining good health.

Proper Foot Care. Proper foot care is a vital factor in the overall performance of personnel, both ashore and afloat. Remember the foot gear you were issued in boot camp? If the fit was not perfect, the following weeks were most unpleasant for you. Proper fitting of shoes and socks is just one aspect of the problem. In military exercises, especially ashore, feet are exposed to tremendous stress. The corpsman's job of monitoring foot conditions will be made easier if the unit's personnel have been taught to clean and dry feet regularly, especially between the toes; to use foot powder to deter chafing and promote absorption; to change socks and boots or shoes regularly, especially in wet environments; and to have foot disorders evaluated and treated promptly to prevent potentially disabling problems.

Proper Exercise. Proper exercise increases the body's resistance to certain diseases and promotes its digestive and excretory functions. Improved muscle tone and physical endurance help the individual fulfill military tasks and raise the level of self-confidence. Working outside in the fresh air enhances the value of exercise and hastens acclimatization to new environments. Smoking and overindulgence in food and drink are detrimental and defeat the purpose of exercise.

Proper Sleep. During sleep the body recharges its nervous energy, repairs damaged cells, and regains its bounce. It is important to sleep undisturbed at regular hours and long enough to awaken refreshed. Continued physical and mental fatigue is detrimental to the maintenance of good health.

IMMUNIZATIONS

Protection of Navy and Marine Corps personnel against certain diseases before exposure to infection is called prophylactic immunization. Prophylactic immunization is limited to diseases that are very serious and for which effective and reliable immunizing agents have been developed.

While unit commanding officers are responsible for ensuring that all military and nonmilitary personnel under their jurisdictions receive the required immunizations and that appropriate records of such immunizations are maintained, the actual performance of these tasks is the responsibility of the Medical Department. (See BUMEDINST 6230.1 series and other appropriate guidelines.)

PRESERVATION AND DISPOSITION OF BIOLOGICALS

Oral poliovirus vaccine and yellow fever vaccine shall be distributed and stored at temperatures below 0°C (32°F). Thawing or evidence of thawing during shipment renders the shipment unacceptable for use. All other biologicals shall be stored at temperatures between 2° and 8°C (35.6° to 46.4°F) and shall not be frozen.

Shipments shall not be accepted for use if there is a change in the physical appearance or evidence suggestive of bacterial contamination or growth. Such shipments shall be withheld from issue and use. A request for disposition instructions, citing identifying data, circumstances, and deficiencies noted, shall be forwarded to the supply source and an information copy to BUMED.

Empty containers of all living vaccines should be handled as infectious wastes. Before these items are discarded they should be burned, boiled, or autoclaved.

Immunizing agents shall not be used beyond the stated expiration dates unless an extension is specifically authorized by BUMED.

VACCINATION PRECAUTIONS

Before injecting a biological product, determine whether the individual has previously shown an unusual degree of sensitivity to a foreign protein. Individuals who give a history of sensitivity to an immunizing agent usually will be exempted from the immunization by a medical officer. Persons with significant allergy to eggs or fowl should not be given vaccines prepared by cultivation in eggs (e.g., typhus, influenza, yellow fever, or measles vaccines). Severe individual reactions or sensitivity to any biological agent or drug shall be recorded in the immunization record, indicating the offending substance, the lot number and manufacturer, the date administered, and the severity of the reaction. In addition, any hypersensitivity to drugs or chemicals known to exist shall be indicated on a separate SF 600. The page designation shall be "Special," and this SF 600 shall be the first medical page on the right side of the Health Record following the NAVPERS 5510/1, Record Identifier for Personnel Reliability. Appropriate entries regarding any hypersensitivity should be made on this page. Hypersensitivity to a local anesthetic or other substance shall also be recorded on the SF 603 and DD 722-1.

Before administering an immunizing agent, provisions shall be made for immediate first aid and medical care of anaphylactic reactions that may occur. A military or civilian member of the Medical Department who is trained and qualified in emergency resuscitative techniques shall be present. An emergency tray containing materials for immediate treatment of serious reactions, including a tourniquet and syringe containing a 1:1,000 aqueous solution of epinephrine, should also be on hand. Consult NAVMED P-5052-15 for other recommended materials and additional information regarding medical emergencies.

In severe reactions, symptoms appear immediately. In generalized anaphylaxis, initial symptoms are generalized pruritis, particularly on the soles of the feet and the palms of the hands, and hyperemia of the skin. Anaphylactic shock will be characterized by circulatory collapse and respiratory embarrassment. Specific symptoms include dyspnea, cyanosis, lumbar pain, collapse, and occasionally rapidly spreading urticaria. Treatment must be rapid and exact to stop progress of shock: Immediately give 0.5 ml of epinephrine 1:1,000 subcutaneously in any available area except the limb where immunized, without stopping to prepare the injection site. Put a tight tourniquet proximal to the injection site (on the side toward the heart) to prevent further absorption of the material. Start an IV drip (except below the tourniquet) using a 5% dextrose/saline solution so that access is available for other medications. Get the patient under a physician's care as rapidly as possible.

Whenever you notice local or constitutional reactions of unexpected severity or frequency, local infection, abscess formation not traceable to techniques of administration, or other significant manifestations that may be due to the use of a biological product, discontinue administration of the lot and request instructions regarding the disposition of the suspected materials. Until you receive a reply, keep all open and unopened packages in the lot under proper storage conditions.

Precaution: Before administering any live virus vaccine except oral poliovirus vaccine to a female, ask her if there is any chance that she may be pregnant. If her answer is affirmative, do not immunize her unless authorized by a physician.

For further information on waivers and exemptions, consult BUMEDINST 6230.1 series.

Aircrew members shall not fly for a minimum of 12 hours (preferably 24 hours) after receiving any immunization except oral poliovirus and smallpox vaccine.

INTERVALS

The prescribed time intervals between individual doses of a basic immunization series shall be regarded as optimal and shall be adhered to as closely as possible. If delays prevent completion of a series within the prescribed time, the next dose, or doses shall be administered at the earliest opportunity. A new series shall not be given. Minimum intervals between doses shall not be reduced under any circumstances. Completion of a basic series, as evidenced by proper entries on an official immunization record, eliminates the need for another basic series of the agent. A single stimulating (booster) dose will suffice. There should be a minimum period of 30 days between doses of live virus vaccines, unless a medical officer directs otherwise.

ROUTINE IMMUNIZATIONS

All immunizing injections except smallpox and plague vaccines may be given either intramuscularly (IM) or subcutaneously (SC). Smallpox immunization is administered in the deltoid area by the multiple pressure technique. Plague vaccine must be given intramuscularly only.

Two or more immunizing agents shall not be mixed in a vial or syringe for the purpose of permitting a single simultaneous injection, since the agents may be biologically or physically incompatible.

When there is insufficient time to permit completion of a required basic series prior to travel, travel shall not be delayed for any except the first dose of the series.

Smallpox Vaccine

All personnel on active duty, regardless of age, are immunized or reimmunized against smallpox every 3 years. The basic series consists of one vaccination with a successful reaction. Normally it is not given to those who are ill unless there is a possibility that they will be exposed to smallpox.

METHOD. To avoid a large lesion with the increased danger of secondary infections, inject the virus by the multiple pressure method (do not cause bleeding) into as small an area as possible. The area shall not cover more than one-eighth of an inch in any direction. To avoid infection, cleanse the area as indicated in NAVMED P-5052-15, prior to vaccination and allow the area to dry. Do not use alcohol which will result in inactivation of the virus. Allow the vaccine to dry for 3 to 5 minutes without exposure to sunlight, then wipe off the excess with sterile cotton or gauze. A specially equipped jet injection gun may also be used by trained personnel. Inspect the vaccination site 6 to 8 days after vaccination and interpret the response as follows:

1. A PRIMARY VACCINATION, if successful, shows a typical vesicle. If none is observed, vaccination procedures should be checked and the vaccination repeated with another lot of vaccine until a successful

result is obtained. Reactions shall be recorded as successful or unsuccessful.

2. Following revaccination, two possible responses may be noted:

a. Major reaction. A vesicular or pustular lesion, or an area of definite palpable induration or congestion surrounding a central lesion, which may crust or ulcer. This reaction indicates that virus multiplication has most likely taken place and that the revaccination is successful.

b. Equivocal reaction. Any other reaction should be regarded as equivocal. These responses may be the consequence of immunity adequate to suppress virus multiplication or may represent only allergic reactions to an inactive vaccine. If an equivocal reaction is observed, revaccination procedures should be checked and revaccination repeated one time.

Typhoid Vaccine
(killed and dried with acetone)

The basic series of two 0.5 ml doses, SC or IM, is required. The second dose shall be given no sooner than 4 weeks after the initial dose. Alert Forces will be revaccinated every 3 years. Never give typhoid vaccine intradermally.

Tetanus-Diphtheria Toxoid

The basic series consists of two 0.5 ml primary injections, SC, or IM, given 1 to 2 months apart. A 0.5 ml reinforcing injection is given approximately 12 months after the second dose. Reimmunization is required every 10 years or may be ordered after a serious injury or burn. If there is no chance of diphtheria contraction, tetanus toxoid alone may be administered.

Oral Poliovirus Vaccine

This live trivalent vaccine is given orally either in distilled unchlorinated water, in simple syrup, or by sterile medicine dropper. The vaccine should be kept frozen until needed and used only for 7 days after the bottle is opened. Never refreeze the vaccine. The basic series consists of three doses, the first two 6 - 8 weeks apart, followed by a third dose 6 - 12 months later.

Influenza Vaccine

Influenza virus vaccine will be given as directed by the Surgeon General. The vaccine is sometimes offered to other personnel and dependents on a voluntary basis. Unless otherwise specified, one injection of 0.5 ml shall be given SC or IM.

Yellow Fever Vaccine

This vaccine is given to all Alert Forces and also to all other DOD personnel who must travel to a yellow fever endemic area. A single 0.5 ml injection is given SC or IM. Reimmunization is required every 10 years.

Cholera Vaccine

This vaccine is given to personnel who must travel to cholera-infected areas. The basic series consists of two injections given SC or IM. The first is 0.5 ml and is followed one or more weeks later by a 1.0 ml dose. Reimmunizations when indicated are given at 6-month intervals and consist of a single 0.5 ml dose SC or IM.

Plague Vaccine

The basic immunization consists of one IM dose of 0.5 ml of plague vaccine. A stimulating dose of 0.2 ml (IM) is given 3 months later. This vaccine is given to all Alert Forces. Reimmunizations are given at 6-month intervals to all personnel who must travel to or reside in a plague-infected area.

SPECIAL IMMUNIZATIONS

Meningococcal, adenovirus and rubella vaccine immunizations are given to basic trainees on schedules as determined by the Surgeon General.

RECORD OF IMMUNIZATIONS

The yellow PHS Form 731 is prepared for each member of the Armed Forces. Data may be entered by hand, rubber stamp, or typewriter. The day, month, and year of each immunization given shall be expressed in this order. The day shall be indicated in Arabic numerals; the month spelled out or abbreviated, using the first three letters of the word; and the year expressed in Arabic numerals either by four digits or by the last two digits. The member's social security number shall be listed for identification purposes. Entries for smallpox vaccines shall indicate whether freeze-dried or liquid vaccine was used. The origin and batch number shall be recorded for yellow fever and smallpox vaccines. Entries for smallpox, yellow fever, and cholera must be authenticated by the DOD Immunization Stamp and the actual signature of the medical officer or a specifically designated representative. All other immunizations are authenticated by initialing. Entries for tetanus toxoid alone will be recorded as "TT." Entries based on prior official records will have the following statement added: "Transcribed from official United States Department of Defense records." Such entries in the case of smallpox, yellow fever, and cholera shall be validated by the signature of a medical officer or a specifically designated representative.

An SF 601 (Immunization Record) will be started for all personnel entering the Navy. It will be prepared in accordance with chapter 16 of the Manual of the Medical Department and contain the social security number of the member for identification purposes.

COMMUNICABLE DISEASES

Communicable diseases, as the name implies, are those diseases that can be transmitted from one host to another. They may be transmitted directly or indirectly to a well person from an infected person or animal, or through the agency of an intermediate animal host, vector, or inanimate environment. The illnesses produced result from infectious agents invading and multiplying in the host, or from their toxins (poisons).

DEFINITIONS

CARRIER. A person or animal that harbors a specific infectious agent in the absence of discernible clinical disease and serves as a potential source of infection for man.

a. Healthy carrier. An infected person without apparent symptoms.

b. Incubatory or convalescent carriers. These carriers present recognizable clinical manifestations and spread the disease during periods of incubation, convalescence, or post-convalescence.

COMMUNICABLE DISEASE. An illness due to a specific infectious agent or its toxic products which may pass or be carried from a reservoir to a susceptible host either directly or indirectly.

COMMUNICABLE PERIOD. The time or times during which an infectious agent may be transferred from an infected person or animal to man.

CONTACT. A person or animal known to have been associated with an infected person or animal or a contaminated environment and to have had the opportunity to acquire the infection.

CONTAMINATION. The presence of an infectious agent on a body surface or on an inanimate article or substance.

DISINFECTION. The killing of infectious agents outside the body by physical or chemical means directly applied.

a. Concurrent disinfection. The disinfection procedures employed during the treatment of a patient with a communicable disease.

b. Terminal disinfection. The disinfection procedures employed after the disposition of a patient with a communicable disease.

DISINFESTATION. A physical or chemical means of destroying undesirable animal and insect pests in a particular area. Disinfestation includes delousing and deratization.

ENDEMIC. A disease or infectious agent that is constantly present in a given region.

EPIDEMIC. The occurence in a region of a group of illnesses of similar nature, clearly in excess of normal expectancy numbers and originating from a common or a propagated source.

EPIZOOTIC. Attacking many animals in a region at the same time.

FOMITE. An object that is capable of harboring or transmitting pathogenic organisms.

FUMIGATION. The destruction of animal forms, usually arthropods and rodents, with gaseous agents.

HOST. A man or other living animal affording subsistence or lodgement to an infectious agent under natural conditions.

IMMUNE PERSON. A person who possesses specific antibodies or cellular immunity to prevent development of clinical illness following exposure to the specific infectious agent of the disease.

INAPPARENT INFECTION. An infection associated with no detectable symptoms even though the causative infectious agent may be identifiable by laboratory examinations. It is also known as latent or subclinical infection.

INCIDENCE RATE. The number of new cases of a specific disease diagnosed or reported during a defined period of time divided by the total population. Usually expressed as cases per 1,000 or 100,000 per annum.

INCUBATION PERIOD. The time interval between exposure to an infectious agent and the appearance of the clinical manifestations of the disease.

INFECTED PERSONS. Individuals who harbor an infectious agent and who have either a manifest disease or an inapparent infection.

INFECTION. The entry and development or multiplication of infectious agents in the body of man or animals. Infection is not synonymous with infectious disease. The result of infection may be inapparent (see inapparent disease) or manifest (see infectious disease).

INFECTIOUS AGENT. An organism capable of producing infection or infectious disease.

INFECTIOUS DISEASE. A disease of man and animal resulting from an infection.

INFESTATION. The lodgement, development, and reproduction of arthropods on the surface of the body or in clothing. Infested premises or articles harbor or give shelter to animal forms, especially arthropods and rodents.

ISOLATION. The separation of an infected person or animal from other persons or animals during the period of communicability to prevent spread of the disease or infectious agent to those who are susceptible.

MORTALITY RATE. The number of deaths reported in a particular population over a specific period of time divided by the total population. The total mortality rate (deaths from all causes) is reported as deaths per 1,000. The disease-specific rate (deaths from one disease) is reported as deaths per 100,000 persons.

PATHOGENICITY. The capability of an infectious agent to cause disease in a susceptible host.

RESERVOIR OF INFECTIOUS AGENTS. A carrier on which an infectious agent depends primarily for survival. The agent lives, multiplies, and reproduces so that it can be transferred to a susceptible host. Reservoirs of infectious agents are man, animals, plants, soil, or organic matter. Man himself is the most frequent reservoir of infectious agents pathogenic to man.

RESISTANCE. The sum total of body mechanisms that interpose barriers to the progress of invasion of infectious agents, or their toxic products.

SOURCE OF INFECTION. The person, animal, object, or substance from which an infectious agent passes immediately to a host. Transfer is often direct from reservoir to host, in which case the reservoir is also the source of infection.

SUSCEPTIBLE. A person or animal presumably not possessing resistance against a particular pathogenic agent and for that reason likely to contract a disease if exposed to such agent.

SUSPECT. A person whose medical history and symptoms suggest that he may have or be developing some communicable disease.

TRANSMISSION OF INFECTIOUS AGENTS. Any mechanism by which a susceptible human host is exposed to an infectious agent.

1. Direct transmission: Direct, immediate transfer of infectious agents to a receptive portal of entry.

a. Direct contact as by touching, kissing, or sexual intercourse.

b. Direct exposure of susceptible tissue to an agent in soil, compost, or decaying vegetable matter in which the agent grows.

c. Direct projection onto the conjunctiva or mucous membranes of the nose or mouth of droplet spray during sneezing, coughing, spitting, singing, or talking. Such droplets usually travel no more than 3 feet (1 meter) from the source.

2. Indirect transmission.

a. Vehicle-borne: Contaminated materials or objects that serve as an intermediate means by which an infectious agent is transported and introduced into a susceptible host through a suitable portal of entry.

b. Vector-borne: Mechanical or biological transmission of an infectious agent to a susceptible host by a crawling or flying insect.

c. Airborne: The dissemination of microbial aerosol particles to a suitable portal of entry, usually the respiratory tract.

(1) Droplet nuclei. The inhalation of the small residues that result from evaporation of droplets and remain suspended in the air of enclosed spaces for relatively long periods.

(2) Dust. The inhalation or settling on body surfaces of coarser particles that may arise from contaminated floors, clothes, bedding, or soil. This does not include large particles that promptly settle out.

REPORTING OF COMMUNICABLE DISEASES

Regulations relative to the reporting of communicable diseases may be found in BUMED Instructions of 6220.3 series concerning Disease Alert Reports. These reports are particularly applicable for reporting outbreaks of infectious diseases that may affect operational readiness; be a hazard to the community; be spread through the transfer of personnel; require diagnostic, epidemiologic, or other medical assistance; or be of such political or journalistic significance that inquiry might be made of higher command or BUMED. They are also used to report the occurrence of internationally quarantinable diseases, including cholera, plague, smallpox, and yellow fever.

COMMUNICABLE DISEASES OF INTERNATIONAL IMPORTANCE

CHOLERA (NAVMED P-5052-23)

Cholera is a serious acute intestinal infection characterized by sudden onset, vomiting, profuse watery stools, rapid dehydration, acidosis, and collapse. Severity differs greatly from place to place and within epidemics; mild cases show only diarrhea. Death may occur within a few hours of onset. Epidemics tend to be explosive.

OCCURRENCE. Historically endemic in parts of Asia. It has recently spread through most of Asia and the Middle East into parts of Africa and Eastern and Southern Europe.

INFECTIOUS AGENT. *Vibrio cholerae*.

RESERVOIR. Man.

MODE OF TRANSMISSION. Transmission occurs through ingestion of water contaminated with feces or vomitus of patients, and, to a lesser extent, feces of carriers, food contaminated by water, soiled hands, or flies. Spread from person-to-person by direct contact is of relatively minor importance, if it occurs at all.

INCUBATION PERIOD. From a few hours to 5 days, usually 2 to 3 days.

PERIOD OF COMMUNICABILITY. Unknown, but presumably while pathogenic organisms are present in feces, until a few days after recovery.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is variable. Recovery from clinical attack affords some protection for a number of years. Artificially induced immunity by vaccines is of variable degree and uncertain duration, but not more than 6 months. Young children are most susceptible.

TREATMENT. Under a medical officer's direction. Prompt fluid therapy using adequate volumes of electrolyte solutions to correct dehydration, acidosis, and hypokalemia. Tetracycline and other antimicrobial agents reduce the duration and volume of diarrhea.

METHODS OF CONTROL.

1. Preventive measures:

a. Sanitary disposal of human feces and use of handwashing facilities.
b. Protection and purification of water supply.
c. Boiling or pasteurization of milk.
d. Sanitary processing, preparation, and serving of foods.
e. Fly control and screening to protect foods from fly contamination.
f. Education of public in personal hygiene.
g. Immunization.

2. Control of patient, contacts, and the immediate environment:

a. Report of local health authority.
b. Isolation: Strict isolation is not required. Hospitalize for acute symptoms.
c. Concurrent disinfection of feces, vomitus, and articles used by the patient. Attendants should disinfect hands after handling articles that may be contaminated.
d. Terminal disinfection. Thorough cleaning of room and articles used by the patient.
e. Quarantine. None.
f. Investigation of contacts and source of infection. Search for unreported cases among contacts. Investigate possibilities of infection from polluted drinking water or from contaminated food and search for vehicle of transmission.

3. Epidemic measures:

a. Adopt emergency measures (boiling, chlorination, etc.) to assure a safe water supply.
b. Ensure the availability and proper use of adequate treatment facilities.
c. Ensure careful supervision of food and drink preparation.
d. Institute an adequate fly control program.

4. International measures: Follow World Health Organization (WHO) regulations.

PLAGUE (NAVMED P-5052-18)

Plague is a severe and often fatal disease with toxemia, high fever, shock, fall in blood pressure, rapid and irregular pulse, restlessness, staggering gait, mental confusion, prostration, delirium, and coma. Lymphadenitis, septicemia, and petechial hemorrhages are common. Intense pain develops in the groin, armpits, or neck with appearance of bubo. Plague occurs mainly in three clinical forms: (a) Bubonic plague is the more common with acutely inflamed and painful swelling of the lymph nodes draining the site of the original infection. Secondary invasion of the blood often leads to localized infection in diverse parts of the body, including the meninges. A secondary, often terminal pneumonia has special significance as the source of primary pneumonic plague in contacts. (b) Primary septicemic plague, proved by blood smear or blood culture, is rare; it is a form of bubonic plague in which the bubo is obscure and may include pharyngeal and tonsillar infections. (c) Primary pneumonic plague is the most serious and infectious form; it may occur in localized and sometimes devastating epidemics. Untreated bubonic plague has a fatality rate of up to 50%. Untreated primary septicemic plague and pneumonic plague are usually fatal. Modern therapy materially reduces the fatality from bubonic plague; pneumonic plague also responds if recognized and treated early.

Diagnosis is confirmed by demonstrating the infectious agent in fluid aspirated from bubos, in blood, or in sputum.

OCCURRENCE. Sylvatic (wild rodent) plague exists in the western third of the United States and in large areas of South America, Africa, the Near East, Central and Southeast Asia, and along the frontier area between Yemen and Saudi Arabia. Plague in man in the United States is limited to rare instances of exposure to wild rodents or their fleas. The disease continues to be potentially dangerous because of vast areas of persisting sylvatic infection.

INFECTIOUS AGENT. *Yersinia pestis (Pasteurella pestis).*

RESERVOIR. Wild rodents are the natural reservoirs of plague; numerous species in many parts of the world are subject to periodic epizootics. Rabits and, rarely, carnivores may also be a source of infection for humans.

MODE OF TRANSMISSION. Bubonic plague is transmitted by the bite of an infective flea, especially *Xenopsylla cheopis*, or by contact with pus from an infected animal. Pneumonic plague and pharyngeal plague are spread by the airborne route by inhalation of exhaled droplets from patients with pneumonic plague or from patients with bubonic plague who develop terminal plague pneumonia. Accidental infections occur among laboratory workers.

INCUBATION PERIOD: From 2 to 6 days in bubonic plague; 2 to 4 days in pneumonic plague; period may be shorter, rarely longer.

PERIOD OF COMMUNICABILITY. Bubonic plague is not directly transmissible from person to person except through terminal plague pneumonia. Fleas may remain infected for days or weeks or months under suitable conditions of temperature and humidity, or may clear themselves of infection. Infective (blocked) fleas are usually short-lived (3 to 4 days). Pneumonic plague is usually highly communicable under climatic or social conditions that lead to overcrowding, especially in unsanitary dwellings.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general.

TREATMENT. Treatment should be supervised by a medical officer. It should begin within 24 hours after onset to reduce mortality. Streptomycin, tetracyclines, and chloramphenicol used early are highly effective.

METHODS OF CONTROL.

1. Preventive measures:

a. Periodic surveys in endemic and potentially epidemic areas to determine the prevalence of rats and rat fleas; continuing inspection of wild rodents and their fleas in areas of sylvatic plague; and suppression of rats by poisoning and trapping. See NAVMED P-5010 for more details.

b. Ratproofing of buildings, reduction of breeding places, and strict rat control aboard ships arriving from plague localities.

c. Education of the public in endemic areas.

d. Use of standard insect repellents to repel fleas and to prevent flea infestation.

e. Active immunization with a vaccine of killed bacteria confers considerable protection.

2. Control of patient, contacts, and the immediate environment:

a. Report to local health authority.

b. Isolation. Hospitalize all patients after ridding their bodies, baggage, and clothing of fleas. Ordinary hospital isolation precautions suffice for patients with bubonic plague; strict isolation is required for patients with primary pneumonic plague or patients developing plague pneumonia.

c. Concurrent disinfection of sputum, purulent discharges, urine, and feces, and articles soiled therewith.

d. Terminal disinfection and thorough cleansing. Bodies of plague victims should be handled with strict aseptic precautions.

e. Quarantine. For contacts, disinfestation with 2% diazinon or 1% malathion and surveillance for 6 days. Start specific treatment as soon as fever appears.

f. No postexposure immunization of contacts. Chemoprophylaxis with broad-spectrum antibiotics such as tetracycline or sulfadiazine may be indicated.

g. Investigation of contacts. Search for infected rodents and fleas or persons exposed to pneumonic plague.

3. Epidemic measures:

a. Investigate all deaths and develop case-finding facilities (laboratory procedures, etc.).

b. Institute intensive flea control in expanding circles from known focal areas.

c. Employ supplemental rat destruction procedures within the affected area.

d. All personnel exposed to definite and repeated risk of infection should be kept under close observation.

e. Protect field workers against fleas by dusting their clothes with insecticide powder.

f. Widespread immunization of the local population is of variable benefit.

4. International measures: Follow WHO regulations.

RELAPSING FEVER

Relapsing fever is a systemic spirochetal disease with febrile periods lasting 2 to 9 days, alternating with afebrile periods of 2 to 4 days, and resulting in 2 to 10 or more relapses. Each febrile period terminates by crisis. Symptoms of the disease are sudden chills followed by high fever, tachycardia, severe headache, nausea, vomiting, delirium, and muscle/joint pain. A rash on the trunk and extremities may be present along with subcutaneous hemorrhage.

Diagnosis is by demonstration of the infectious agent in darkfield preparations of fresh blood or stained thick blood films, or by intraperitoneal inoculation of white rats with 15 to 25 ml of blood taken during the febrile period and before crisis.

OCCURRENCE. Epidemic louse-borne relapsing fever occurs in limited localities in Asia, East Africa (the Sudan and Ethiopia), north and central Africa, and South Africa. Epidemics are common in wars, famine, or other situations where malnourished, overcrowded populations with poor personal hygiene favor multiplication and wide dissemination of the louse vector. It has not been reported in the United States for many years. The endemic tick-borne disease occurs in tropical Africa, Spain, North Africa, Saudi Arabia, Iran, India, parts of central Asia, and North and South America. It occurs in limited localities of several western states in the U.S.

INFECTIOUS AGENT. *Borrelia recurrentis*, a spirochete.

RESERVOIR. For louse-borne disease, man; immediate source of infection is an infective louse. The natural reservoir of some tick-borne relapsing fevers in the U.S. is wild rodents, principally ground squirrels and prairie dogs, and ticks through transovarian transmission.

MODE OF TRANSMISSION. By crushing an infective louse, *Pediculus humanus*, over the bite wound or an abrasion of the skin, or by the bite or coxal fluid of an argasid tick.

INCUBATION PERIOD. Five to 15 days, usually 8 days.

PERIOD OF COMMUNICABILITY. The louse becomes infective 4 to 5 days after ingestion of blood from an infected person and remains so for life (20 to 40 days). Infected ticks can live without feeding for several years and remain infective.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general. Duration of immunity after clinical attack is unknown, but probably less than 2 years.

TREATMENT. Tetracyclines under a medical officer's supervision.

1. Preventive measures:

a. Louse control by dusting clothing and people by hand or power blower with a residual insecticide powder. Recommendations are published in the "Recommendations for Chemical Control of Disease Vectors and Economic Pests". This publication is available from Disease Vector Ecology and Control Center.

b. Tick control, especially in living quarters and structures, by sealing hiding places in walls and floors or by spraying with effective residual agents, such as BHC or Baygon.

2. Control of patient, contacts, and the immediate environment:

a. Report to local health authority (required by WHO).

b. Isolation. None.

c. Concurrent disinfection. None, if delousing has been done.

d. Quarantine. Exposed louse-infected persons may be released after application of a residual insecticide; otherwise, quarantine for 9 days.

e. Investigation of contacts and source of louse-borne infection is unprofitable for the individual case; for tick-borne, search for sources of infection.

TYPHUS FEVER, EPIDEMIC LOUSE-BORNE (NAVMED P-5052-3)

Typhus fever is a rickettsial disease that continues to exist in many parts of the world. The onset is variable, often sudden and marked by headache, chills, fever, and general pains; a macular eruption appears on the 5th or 6th day, toxemia is usually pronounced, and the disease terminates by rapid lysis after about 2 weeks of fever. In the absence of specific therapy, the fatality rate varies from 10% to 40% and increases with age.

OCCURRENCE. Among louse-infested people who live under unhygienic conditions in the colder areas of the world. Endemic centers exist in mountainous regions of Mexico, Central and South America, the Balkans, Eastern Europe, Africa, and numerous countries of Asia.

INFECTIOUS AGENT. *Rickettsia prowazeki.*

RESERVOIR. Man is the reservoir and is responsible for maintaining the infection during interepidemic periods.

MODE OF TRANSMISSION. The body louse, *Pediculus humanus*, is infected by feeding on the blood of a patient with febrile typhus fever. Infected lice excrete rickettsiae in their feces and usually defecate at the time of feeding. Man is infected by rubbing feces or crushed lice into the wound made by the bite or into superficial abrasions of the skin. Inhalation of dried infective louse feces as dust from dirty clothes may account for some infections.

INCUBATION PERIOD. Seven to 14 days, commonly 12 days.

PERIOD OF COMMUNICABILITY. Patients are infective for lice during the febrile period and for 2 to 3 days thereafter. The living louse is infective as soon as it begins to pass rickettsiae in its feces, earlier if crushed. The louse dies within 3 weeks after infection, but the dead insect remains infective for weeks. The disease is not directly transmissible from person to person.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general. The disease in children and in vaccinated adults is mild and may go unrecognized. One attack usually confers permanent immunity.

TREATMENT. Tetracyclines or chloramphenicol under a medical officer's supervision.

METHODS OF CONTROL.

1. Preventive measures:

a. Application of a residual insecticide powder (1% lindane) at regular intervals to clothing and persons of populations living under conditions favoring lousiness. Use 1% malathion if lice show resistance to lindane.

b. Improvement of living conditions with provisions for frequent bathing and washing of clothes.

c. Individual prophylaxis of persons subject to unusual risk through insecticide application at appropriate intervals.

d. Immunization of susceptible persons entering typhus areas, particularly military or labor forces.

2. Control of patient, contacts, and the immediate environment:

a. Report to local health authority.

b. Isolation is not required after proper delousing.

c. Concurrent disinfection. Appropriate insecticide applied to clothing and bedding of patient and contacts.

d. Terminal disinfection. If death occurs before delousing, thorough application of an insecticide to body and clothing.

e. Quarantine. Louse-infested susceptibles exposed to the disease should be quarantined for 15 days but may be released following application of an insecticide with residual effect.

f. Immunization of all immediate contacts.

g. Investigation of contacts. Every effort should be made to trace the infection to the immediate source.

3. Epidemic measures:

a. Delousing.

b. Immunization of persons in contact with the disease; vaccination may be offered to entire community.

4. International measures:

a. Telegraphic notification to WHO and adjacent countries of an outbreak.

b. Immunization is recommended for all people who plan to travel to or work in areas where typhus is present.

SMALLPOX

Smallpox is a systemic viral disease characterized by sudden onset with fever, malaise, headache, severe backache, prostration, and occasionally abdominal pain, continuing for 2 to 4 days. The temperature then falls and a rash appears, which passes through stages of macules, papules, vesicles, pustules, and finally scabs, which fall off at the end of the 3rd or 4th week. The erruption is usually general and more profuse over irritated areas, prominences, and extensor surfaces. It appears first on the face and is more abundant on the face and extremities than on the trunk.

Smallpox is often misdiagnosed as chickenpox. Diagnosis is confirmed by laboratory identification of the virus.

OCCURRENCE. This disease may strike anywhere in the world, but in recent years it has been controlled by a worldwide inoculation program. A global smallpox eradication program was started in 1967. The last recorded case other than in a laboratory occurred in 1977.

INFECTIOUS AGENT. *Variola virus*.

RESERVOIR. Man.

MODE OF TRANSMISSION. By close contact with persons sick with the disease. contact may be indirect by articles freshly contaminated, by respiratory discharges of patient, or by materials from the lesions of the skin and mucous membrane. The scabs of the lesions remain infective for variable periods. Airborne spread may occur.

INCUBATION PERIOD. From 7 to 17 days, commonly 10 to 12 days.

PERIOD OF COMMUNICABILITY. From the development of the earliest lesions to

406

disappearance of all scabs; usually about 3 weeks. Most communicable during the first week.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is universal, although exposure does not always result in disease. Permanent immunity usually follows recovery. Immunity acquired by vaccination gradually diminishes.

TREATMENT. Supportive, under a medical officer's supervision.

METHODS OF CONTROL.

1. Preventive measures: Vaccination.
2. Control of patient, contacts, and the immediate environment:

a. Report to local health authority.

b. Isolation in hospital in screened rooms or wards until all scabs have disappeared.

c. Concurrent disinfection. Oral and nasal discharges should be deposited in a paper bag and burned. All articles associated with patient should be sterilized by high pressure steam or boiling.

d. Terminal disinfection. Thorough cleaning of sick room and furniture; sterilization of bedding.

e. Quarantine. All contacts, intimate or indirect, should be vaccinated or revaccinated and placed under surveillance for 17 days after last contact with the patient. At the first sign of fever or other illness, the person should be isolated.

f. Immunization of contacts. All contacts should be promptly vaccinated.

g. Investigation of contacts and source of infection. The source of infection must be found. Persons with supposed chickenpox or patients with hemorrhagic or pustular disease should be considered as the possible sources of infection.

3. Epidemic measures:

a. Isolation of patients and suspects until they are no longer infective.

b. Surveillance of suspects until 17 days after last contact with smallpox patient.

c. Full public disclosure of the facts to avert panic.

d. Mass immunization if deemed necessary.

4. International measures:

a. Telegraphic notification to WHO and adjacent countries of the first case of smallpox.

b. Measures applicable to aircraft, ships, and land transport arriving from smallpox areas are specified in International Health Regulations (1969), WHO.

c. Infected persons or suspects are not allowed to depart from a country. Some countries require arriving travelers to present evidence of recent vaccination.

YELLOW FEVER

A typical attack of yellow fever is characterized by sudden onset, fever, headache, backache, nausea, vomiting, and prostration. As the disease progresses, the pulse rate slows, though the temperature may be elevated. Leukopenia appears early and is most pronounced about the 5th day. Common hemorrhagic symptoms include epistaxis, buccal bleeding, hematemesis, and melena. Jaundice is moderate early in the disease and is intensified later.

OCCURRENCE. Urban yellow fever outbreaks are still reported from Africa in areas contiguous to rain forest regions where yellow fever is endemic. Jungle yellow fever occurs in Central and South America and in Africa.

INFECTIOUS AGENT. The virus of yellow fever.

RESERVOIR. In urban and certain rural areas, man and *Aedes aegypti* mosquitoes; in jungle areas, mainly monkeys and forest mosquitoes.

MODE OF TRANSMISSION. In urban and certain rural areas, by the bite of infective *A. aegypti* mosquitoes. In other areas several species of forest mosquitoes transmit the disease.

INCUBATION PERIOD. Three to 6 days.

PERIOD OF COMMUNICABILITY. Shortly before onse of fever and for the first 3 to 5 days of illness. Highly communicable where susceptible persons and vector mosquitoes coexist.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general. Recovery from the disease results in lasting immunity; second attacks are unknown. Active immunity may be induced by a suitable vaccine.

TREATMENT. Supportive, under a medical officer's supervision..

METHODS OF CONTROL.

1. Preventive measures:

a. Urban yellow fever may be prevented by eradication of *A. aegypti* mosquitoes. See NAVMED P-5010 for complete instructions.

b. Sylvan or jungle yellow fever can best be controlled by vaccination, which is recommended for all personnel who will be exposed to forest areas where yellow fever is endemic.

c. Active immunization of all persons exposed to infection because of occupation, residence, or travel.

2. Control of patient, contacts, and the immediate environment:

a. Report to local health authority.

b. No isolation needed. Prevent access of mosquitoes to patient during first 3 days.

c. Concurrent disinfection is not needed.

d. Terminal disinfection is not needed.

e. All contacts not previously immunized should be vaccinated immediately.

f. Investigation of contacts and source of infection. Inquiry about all places visited by patient 3 to 6 days before onset to locate focus of the disease. Close observation of all persons visiting the suspect area is indicated.

3. Epidemic measures:

a. Urban or *A. aegypti*-transmitted yellow fever:

(1) Mass vaccinations, beginning with persons most exposed.

(2) Application of residual insecticides to all houses in the community.

(3) Larvicidal application to all potential breeding places of *A. aegypti*.

b. Sylvan or jungle fever:

(1) Vaccination of all persons living in or near forested areas or entering such areas.

(2) Avoidance of infected forest areas by unvaccinated or newly vaccinated individuals.

4. International measures:

a. Telegraphic notification to WHO and adjacent countries of the first case of yellow fever arising within a country.

b. Measures applicable to all modes of transportation arriving from yellow fever areas are listed in International Health Regulations.

c. Animal quarantine. Monkeys and other wild primates arriving from yellow fever areas may be quarantined for 7 days after leaving such areas.

d. International travelers. A valid certificate of vaccination against yellow fever is required by many countries.

AMEBIASIS (NAVMED P-5052-7)

This infection of the colon is usually asymptomatic; however, symptoms may range from mild abdominal discomfort with diarrhea containing blood or mucus alternating with constipation to acute dysentery with fever, chills, and bloody or mucoid diarrhea. The presence of *Entamoeba histolytica* trophozoites or cysts in the stool confirms most cases of amebiasis.

OCCURENCE. Worldwide, but more common in areas with poor sanitation and health education.

INFECTIOUS AGENT. *Entamoeba histolytica.*

RESERVOIR. An infected person (often an asymptomatic carrier). Fifty to 60 percent of all infected persons are usually asymptomatic.

MODE OF TRANSMISSION. Endemic spread is by soiled hands of food handlers, contaminated water, hand-to-mouth transfer of feces, flies and cockroaches, and raw vegetables and fruits fertilized with untreated human feces. Epidemic spreads mainly by contaminated water containing cysts from feces of infected persons.

INCUBATION PERIOD. From a few days to several months or years; usually 2 to 4 weeks.

PERIOD OF COMMUNICABILITY. During the period of cyst passing, which may last for years.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general. Immunity to reinfection is uncertain. There is no artificial immunity.

TREATMENT. Under a medical officer's supervision.

METHODS OF CONTROL.

1. Preventive measures:

a. Improvement of living environment.

b. Sanitary disposal of human feces.

c. Protection of public water supplies from fecal contamination.

d. Education of the general public in personal hygiene.

e. Fly control and protection of food against fly contamination (see NAVMED P-5010).

f. Preventive medicine inspection of food handlers and public eating places.

2. Control of patient, contacts, and immediate environment:

a. Report to local health authorities.

b. Isolation. None. Known cyst passsers should be excluded from preparation, processing, and serving of food.

c. Concurrent disinfection. Sanitary disposal of feces.

d. Quarantine. None.

e. Immunization. Not applicable.

f. Investigation of contacts and source of infection. Household members and other suspected contacts should have microscopic examination of feces and serologic tests. Search for modes of transmission.

3. Epidemic measures: Prompt epidemiologic investigation and appropriate corrective measures.

BOTULISM

Botulism is a serious intoxication (not an infection) characterized by weakness, extreme dryness of the mouth, and oculomotor or other symmetrical motor cranial-nerve paralyses.

Diagnosis is confirmed by the presence of the specific toxin in blood serum, feces, or a suspected food item. Evaluation of the case history and the occurrence of other cases of poisoning related to the same meal or food simplify the diagnosis.

OCCURRENCE. Sporadic and family-grouped cases occur in most countries.

TOXIC AGENT. Toxins produced by *Clostridium botulinum.*

RESERVOIR. Soil, water, and the intestinal tract of fish and animals.

MODE OF TRANSMISSION. By eating food that has been improperly processed or stored.

INCUBATION PERIOD. Symptoms usually appear within 12 to 36 hours.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general.

TREATMENT. A botulinus antitoxin given IV and IM under a medical officer's supervision.

METHODS OF CONTROL. Education of food service personnel in the proper preparation of foods and in the recognition of spoiled food are of primary importance. Alert personnel in foreign ports to possible sources of infection.

CHICKENPOX—HERPES ZOSTER (VARICELLA—SHINGLES)

Chickenpox is an acute viral disease of sudden onset with slight fever, mild constitutional symptoms, and skin eruptions that are maculopapular, then vesicular, and leave a granular scab. The lesions first appear on the covered areas of the body and are more numerous on these parts throughout the course of the disease. The different stages of the eruption may be noted on the same region of the body at the same time.

Herpes zoster is a local manifestation of recurrent, recrudescent, or reactivation infection with the same virus. Vesicles with an erythematous base are restricted to skin areas supplied by sensory nerves of a single or associated group of dorsal root ganglia. Lesions may appear in crops in irregular fashion along nerve pathways, are usually unilateral, and are deeper seated and more closely aggregated than chickenpox; histologically they are identical. Severe pain and paresthesia are common. Occurs mainly in older adults.

OCCURRENCE. Nearly universal. More prevalent in winter and early spring.

INFECTIOUS AGENT. The varicella-zoster virus.

RESERVOIR. An infected person.

MODE OF TRANSMISSION. From person to person by direct contact, droplet or airborne spread of secretions of the respiratory tract of infected person. Indirectly through freshly soiled articles. May be contracted from patients with herpes zoster.

INCUBATON PERIOD. From 2 to 3 weeks; commonly 13 to 17 days.

PERIOD OF COMMUNICABILITY. As long as 5 days before the eruption and not more than 6 days after the last crop of vesicles.

SUSCEPTIBILITY AND RESISTANCE. Children are especially susceptible. The disease is more serious in adults.

TREATMENT. Symptomatic treatment is normally all that is necessary. Wet compresses control itching. Antihistamines may be used in severe cases. The patient should be bathed frequently with soap and water and kept in clean undergarments. An infected vesicle may be treated with neomycin-bacitracin ointment.

METHODS OF CONTROL. Disinfection of all contaminated articles. Protect the nonimmune against exposure.

DENGUE FEVER (NAVMED P-5052-30)

Dengue fever is an acute febrile infection characterized by sudden onset, fever for 5 to 7 days, headache, retro-orbital pain, rash, and joint and muscle pain. The rash usually appears 3 to 4 days after onset of fever. Early general erythema occurs in some cases. Petechiae may appear on the feet or legs, in the axillae, or on the palate on the last day of fever or shortly thereafter. Dark-skinned races frequently have no visible rash. Recovery may be associated with prolonged fatigue and depression. Leukopenia and lymphadenopathy are usual.

OCCURRENCE. Endemic or present in most tropical areas of the world.

INFECTIOUS AGENT. The viruses of dengue fever.

RESERVOIR. Usually man and mosquitoes.

MODE OF TRANSMISSION. By the bite of infective *Aedes* mosquitoes.

INCUBATION PERIOD. From 3 to 15 days, commonly 5 to 6 days.

PERIOD OF COMMUNICABILITY. Not directly transmissible from person to person. Patients are infective for mosquitoes from the day before onset until the 5th day of the disease. The mosquito is infective 8 to 11 days after the blood meal and remains so for life, approximately 30 days.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is universal. Immunity acquired through attack is of long duration. Children usually have a milder disease than adults.

TREATMENT. As directed by a medical officer. Most cases respond to O_2 therapy and rapid replacement with electrolyte solutions and plasma.

METHODS OF CONTROL.

1. Preventive measures:

a. Eradication of vector mosquitoes through careful use of insecticides and elimination of breeding places. (See NAVMED P-5010 for detailed instructions.)
b. Public education on measures for protection against mosquitoes.

2. Control of patient, contacts, and immediate environment:

a. Report to local health authority.
b. Isolation of patients in screened rooms for 5 days after onset.

SHIGELLOSIS (Bacillary Dysentery) (NAVMED P-5052-28)

Shigellosis is an acute bacterial infection of the intestines, characterized by diarrhea, accompanied by vomiting, fever, cramps, and tenesmus. In severe cases the stools may contain blood, mucus, and pus.

Diagnosis is based on laboratory findings of the bacillus in a stool sample.

OCCURRENCE. Worldwide, primarily in children under 10 years of age, frequently in populations where malnutrition and poor sanitation coexist. Crowding is also a factor.

INFECTIOUS AGENT. Various species of the genus *Shigella*.

RESERVOIR. The only significant reservoir is man.

MODE OF TRANSMISSION. By direct or indirect fecal-oral transmission from a patient or a carrier. Contaminated food and drink are the most common vehicles. Flies are mechanical vectors.

INCUBATION PERIOD. From 1 to 7 days, usually less than 4 days.

PERIOD OF COMMUNICABILITY. During acute infection and until feces are free from infectious agent, usually within 4 weeks of illness.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general, but the disease is more severe in children.

TREATMENT. Fluid and electrolyte replacement is of primary importance. Antibiotics which are absorbed from the gastrointestinal tract (ampicillin, tetracyclines, chloramphenicol) may be used under a medical officer's direction.

METHODS OF CONTROL.

1. Sanitary disposal of human feces.
2. Education and personal hygiene.
3. Strict supervision of messing facilities and exclusion of infected persons from handling food.
4. Boiling or pasteurization of milk.
5. Protection and purification of water supplies.
6. Control of flies (see NAVMED P-5010).
7. Isolation of patients during acute illness with rigid precautions in handling contaminated articles.
8. In foreign ports, recommend that liberty parties eat only cooked foods, served hot, and fruits that have been washed thoroughly and then peeled by the person who eats them.

VIRAL HEPATITIDES

Three distinct diseases are grouped as viral hepatitides; they are similar in many ways but differ in etiology and in some epididemologic, immunologic, clinical, and pathological characteristics.

A. HEPATITIS A (epidemic hepatitis, epidemic jaundice, infectious hepatitis, catarrhal jaundice, viral hepatitis type A)

Onset is usually abrupt with fever, malaise, anorexia, nausea, and abdominal discomfort, followed within a few days by jaundice. Convalescence is usually prolonged. In general, severity increases with age, but complete recovery without sequelae or recurrences is the rule.

OCCURRENCE. Worldwide, sporadic, and epidemic, with a tendency to cyclic recurrences.

INFECTIOUS AGENT. Particles measuring 27 mm with the characteristics of an enterovirus or a parovirus have been visualized in infective feces of human subjects.

RESERVOIR. Man, chimpanzees, and, less frequently, certain other nonhuman primates.

MODE OF TRANSMISSION. Person-to-person contact, presumably in the majority of cases by the fecal-oral route, however, recent data indicate an increase in spread by parenteral inoculation of contaminated human blood products. The infectious agent is present in circulating blood prior to onset of jaundice and for a few days later.

INCUBATION PERIOD. Dose related: averages 30 days.

PERIOD OF COMMUNICABILITY. During the latter half of the incubation period, continuing for a few days after onset of jaundice (or during peak transaminase activity in anicteric cases).

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general. Duration of immunity after attack is unknown, but it is probably lifelong.

TREATMENT. None.

METHODS OF CONTROL.

1. Preventive measures:

a. Education of public in general hygiene.

b. Proper sterilization of syringes and needles.

c. Travelers to endemic areas may be given immune serum globulin (ISG). See BUMEDINST 6230.13 series.

2. Control of patient, contacts, and the immediate environment:

a. Report to local health authority.

b. Isolation. Enteric precautions during first 2 weeks of illness and at least 1 week after onset of jaundice.

c. Concurrent disinfection. Sanitary disposal of feces, urine, and blood.

d. Immunization of close contacts. Passive immunization with ISG (IM) as soon as possible after exposure. See BUMEDINST 6230.13 series.

3. Epidemic measures: Determine source of infection and control it.

B. HEPATITIS B (homologous serum jaundice, serum hepatitis, Australia antigen hepatitis, viral hepatitis type B).

Onset is usually insidious, with anorexia, vague abdominal discomfort, nausea, and vomiting, sometimes anthralgias, often progressing to jaundice. Fever may be absent or mild. The hepatitis B surface antigen (HB_sAg) can be demonstrated in the blood by radioimmunoassay.

OCCURRENCE. Worldwide; endemic with little seasonal variation.

INFECTIOUS AGENT. A virus of probable deoxyribonucleic acid (DNA) content capable of expressing several noninfective morphological forms in addition to an infectious virion.

RESERVOIR. Man and possibly chimpanzees.

MODE OF TRANSMISSION. By direct percutaneous inoculation by needle of human blood plasma, serum, thrombin, fibrinogen, packed red cells, cryoprecipitate, and other blood products from an infected person. Non-needle, percutaneous transfer of infected serum may occur through minute skin cuts or abrasions. By introduction of infective serum, saliva, or semen onto mucosal surfaces. By accidental ingestion of infective blood in occupations related to the handling of blood and blood products.

INCUBATION PERIOD. Usually 45 to 160 days, average 60 to 90 days.

PERIOD OF COMMUNICABILITY. Blood from experimentally inoculated volunteers has been shown to be infective many weeks before the onset of first symptoms. Blood remains infective through the acute clinical course of the disease and during the chronic carrier state, which may persist for years.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general. The disease is usually milder in children.

TREATMENT. None.

METHODS OF CONTROL.

1. Preventive measures:

a. Limit administration of unscreened whole blood or potentially hazardous blood products to those patients in clear and immediate need of such therapeutic measures.

b. Maintain surveillance of all cases of post-transfusion hepatitis.

c. Adequately sterilize all syringes and needles.

2. Control of patients, contacts, and the environment:

a. Report to local health authority.

b. Isolation. Enteric precautions for duration of stay for hospitalized patients.

c. Non-A, Non-B, VIRAL HEPATITIS. This disease has only recently been identified as a separate entity and is a diagnosis of exclusion once Hepatitis A and B have been ruled out by appropriate diagnostic tests. This disease appears to encompass the majority of post-transfusion hepatitis cases in the United States. Prevention is similar to that for Hepatitis B.

INFLUENZA

An acute infectious disease of the respiratory tract characterized by abrupt onset of fever, chills, headache, myalgia, and sometimes prostration. Coryza and sore throat are common, especially in later stages. Cough is almost universal, often severe and protracted. Recovery is usually in 2 to 7 days. Severe disease or death is usually limited to the elderly and those previously debilitated by disease. Complications are viral pneumonia, bacterial pneumonia, and, rarely, myocarditis.

OCCURRENCE. In pandemics, epidemics, localized outbreaks, and as sporadic cases. Major epidemics tend to be periodic; epidemics of influenza type A have appeared in the U.S. at intervals of 2 to 3 years; influenza type B usually not less than 4 to 6 years.

INFECTIOUS AGENT. Influenza viruses A and B have long been reccognized; influenza virus C, more recently recognized, has thus far appeared only in localized outbreaks.

RESERVOIR. Man is the reservoir, although mammalian reservoirs are suspected as sources of new human strains.

MODE OF TRANSMISSION. Direct or indirect contact and airborne.

INCUBATION PERIOD. Usually 24 to 72 hours.

PERIOD OF COMMUNICABILITY. Probably limited to 3 days from clinical onset.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is universal. Particular epidemics tend to be age-specific.

TREATMENT. None, symptomatic.

METHODS OF CONTROL.

1. Active immunization at the start of the winter season. See BUMEDINST 6230.1 series.
2. Education of the public in basic personal hygiene.

MALARIA (NAVMED P-5052-10 AND BUMEDINST 6230.11 series)

Malaria is a systemic disease that begins with malaise followed by chills, rapidly rising temperature, headache, and nausea and ending with profuse sweating. After an afebrile interval the cycle of chills, fever, and sweating is repeated every 24 to 72 hours. The more serious, falciparum malaria, is not characterized by recurrence.

OCCURRENCE. Between latitudes 40° South and 40° North.

INFECTIOUS AGENTS. Protozoa of the genus *Plasmodium*, including: *Plasmodium vivax*—for vivax or benign tertian malaria; *P. malariae*—for quartan malaria; *P. falciparum*—for falciparum or malignant tertian malaria; and *P. ovale*—for ovale malaria, seen only in West Africa.

RESERVOIR. Man.

MODE OF TRANSMISSION. From man to mosquito to man. Transmitted by an infective female *Anopholes* mosquito, or by injection or transfusion of blood from an infected person.

INCUBATION PERIOD. Average 12 days for *P. falciparum*, 19 days for *P. vivax* and *P. ovale*, and 30 days for *P. malariae*.

PERIOD OF COMMUNICABILITY. As long as infective gametocytes are present in the blood of patients. The female mosquito remains infective for life after taking the blood meal.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is universal; it is sometimes reduced by previous infection.

TREATMENT. Chloroquine and primaquine under a medical officer's direction.

METHODS OF CONTROL.

1. Chemoprophylaxis with a combination of chloroquine-primaquine is an integral part of military prevention and control of malaria. The first dose should be taken at least 24 hours before entering an endemic area. Thereafter 1 tablet should be taken every 7 days while in the endemic area.

2. "Terminal" prophylaxis consisting of primaquine (15 mg p.o.) should be taken daily for 14 days after leaving the endemic area. "Terminal" prophylaxis may also be accomplished by taking 1 chloroquine-primaquine tablet weekly for 8 weeks.

3. Be sure Health Record entries reflect the duration and type of chemoprophylaxis used.

4. Malaria "discipline"—insect repellents, protective clothing, nets, etc., is a command responsibility, but the Medical Department representative is responsible for ensuring that antimalarials are available and for educating personnel in their use.

5. BUMEDINST 6230.11 series is revised periodically to keep up to date on changes in chemoprophylaxis and treatment.

MEASLES (Morbilli, Hard Measles, Rubeola, Red Measles)

Measles is a highly communicable viral disease. Initial symptoms include fever, coryza, severe cough, conjunctivitis, and Koplik spots on the buccal mucosa. Three to 7 days after the onset symptoms, the characteristic rash appears, beginning on the face and becoming generalized. Body temperature may rise to 104°F (40°C), but fever soon falls. The rash sometimes terminates as a branny desquamation. Diagnosis is normally by symptoms. Measles should be suspected in any unvaccinated child who demonstrates the initial symptoms.

OCCURRENCE. Common in childhood throughout the world. Primarily a winter/spring disease, but does occur during other seasons.

INFECTIOUS AGENT. The virus of measles.

RESERVOIR. Man.

MODE OF TRANSMISSION. By droplet spread or direct contact with nasal or throat secretions or urine of infected persons. Indirectly, airborne or fomites.

INCUBATION PERIOD. From 8 to 13 days to onset of fever; about 14 days until rash appears.

PERIOD OF COMMUNICABILITY. From the beginning of the prodromal period to 4 days after appearance of the rash.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general. An attack usually confers lifelong immunity.

TREATMENT. None, symptomatic.

METHODS OF CONTROL.

1. Use of live attenuated virus vaccines. Vaccine given before or on the day of exposure usually prevents natural measles.
2. Avoidance of exposure.

RUBELLA (German Measles)

Rubella is a mild febrile infectious disease with a characteristic diffuse punctate and macular rash sometimes resembling that of measles, scarlet fever, or both. There may be few or no constitutional symptoms in children, but adults may experience a 1- to 5-day prodrome characterized by low-grade fever, headache, malaise, mild coryza, and conjunctivitis. Enlarged, tender lymph nodes usually develop 4 to 10 days before the rash.

The disease is of special concern to pregnant women because congenital rubella syndrome occurs in 20% to 25% of the infants born to women who acquire rubella in their first trimester of pregnancy.

OCCURRENCE. Worldwide; more prevalent in winter and spring.

INFECTIOUS AGENT. Rubella virus.

RESERVOIR. Man.

MODE OF TRANSMISSION. Droplet spread or direct contact with nasopharyngeal secretions of infected persons, or by indirect contact with articles freshly soiled with discharges from the nose and throat of patients. Airborne transmission may occur. Also passed to the fetus by the infected mother.

INCUBATION PERIOD. From 14 to 21 days; usually 18 days.

PERIOD OF COMMUNICABILITY. For 7 to 13 days before and 4 to 14 days after onset of rash.

SUSCEPTIBILITY. General.

TREATMENT. None, symptomatic.

METHODS OF CONTROL.

1. Live attenuated vaccine (except for pregnant women).
2. Immune serum globulin.
3. Isolation of patients from unvaccinated women of child-bearing age.

MENINGOCOCCAL MENINGITIS (NAVMED P-5052-32)

Meningococcal meningitis is an acute bacterial infection of the meninges of the brain and spinal cord and of the blood (meningococcemia). Symptoms include sudden onset, fever, headache, stiff neck, and vomiting. The victim may exhibit signs of dehydration, shock, delirium, and gradual loss of consciousness. Frequently a petechial rash with pink macules appears.

OCCURRENCE. Worldwide, with occasional epidemics in segregated populations, such as military units.

INFECTIOUS AGENT. *Neisseria meningitidis (N. intracellularis).*

RESERVOIR. Man.

MODE OF TRANSMISSION. Direct contact, including droplets and discharges from the nose and throat of infected persons (more often from the carriers than cases). Indirect contact with soiled articles is of little significance because the meningococcus is very susceptible to chilling and drying.

INCUBATION PERIOD. From 2 to 10 days, normally 3 to 4 days.

PERIOD OF COMMUNICABILITY. Until meningococci are no longer present in discharges from the nose and throat. Meningococci usually disappear from nasopharyngeal discharges within 24 hours after administration of massive doses of appropriate specific treatment.

TREATMENT. Under the direction of a medical officer. Penicillin given parenterally in adequate doses is the drug of choice. Ampicillin or Chloramphenicol may be used in patients allergic to penicillin.

METHODS OF CONTROL.

1. Education as to personal hygiene and the necessity of avoiding direct contact or droplet infection.
2. Prevention of severe overcrowding in living quarters and working spaces, especially in barracks, camps, ships, and schools.
3. Isolation until 24 hours after the start of chemotherapy.
4. Concurrent disinfection of discharges from the nose and throat and articles soiled therewith. Terminal cleaning.
5. Vaccination of recruits.
6. Close surveillance of contacts for early signs of illness.

MUMPS (Infectious Parotitis)

Mumps is an acute viral disease characterized by chills, headache, anorexia, malaise, fever, and painful enlargement of the salivary glands, usually the parotid and sometimes the sublingual or submaxillary glands. When mumps occurs in persons past puberty, the testes and ovaries may be involved. Frequently other areas of the body are also affected.

Diagnosis is by symptoms in epidemic cases. Isolated cases should be handled by a medical officer to rule out medical problems presenting similar symptoms.

OCCURRENCE. Worldwide. Less common than other childhood diseases; more prevalent in winter and spring.

INFECTIOUS AGENT. The virus of mumps.

RESERVOIR. Man.

MODE OF TRANSMISSION. Direct contact with saliva of an infected person; droplet spread.

INCUBATION PERIOD. From 12 to 26 days.

PERIOD OF COMMUNICABILITY. From about 6 days before the appearance of symptoms until 9 days thereafter.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general. Second attacks are rare.

TREATMENT. Symptomatic. Bed rest during febrile periods, with soft diet and analgesics. Isolate the patient until glandular swelling recedes.

METHODS OF CONTROL. Immunize personnel with live mumps virus vaccine.

PEDICULOSIS (Lousiness)

Pediculosis is infestation of the hairy parts of the body, or clothing, with adult lice, larvae, or nits.

OCCURRENCE. Worldwide. Prevails in areas of poor sanitation and living conditions. Common among school children.

INFESTING AGENTS. *Pediculus humanus capitis* (head louse), *P. humanus corporis* (body louse), and *Phthirus pubis* (crab louse).

MODE OF TRANSMISSION. Direct contact with infested persons; indirect contact with clothing of such persons.

INCUBATION PERIOD. The eggs of lice hatch in approximately 1 week, and sexual maturity is reached within 2 weeks.

PERIOD OF COMMUNICABILITY. Until all lice and their nits have been destroyed.

SUSCEPTIBILITY AND RESISTANCE. All persons who live in or encounter an environment suitable for the growth of lice.

TREATMENT. Application of 1% malathion dusting powder is effective for body and head lice; gamma benzene hexachloride (lindane), 1% dusting powder, or 1% shampoo (Kwell), is the agent of choice in the U.S.

METHODS OF CONTROL.

1. Good personal hygiene.
2. Avoid personal contact with infected people.
3. Use of appropirate insecticide—1% malathion dusting powder, lindane, Kwell powder or shampoo.
4. Dust or dry clean clothes.

VIRAL PNEUMONIA
(Excluding influenza)

Viral pneumonia is a respiratory infection characterized by fever, chills, anorexia, myalgia, and malaise. Most cases are mild but can become serious, especially in association with influenza.

Diagnosis is based on clinical findings and serologic tests. The absence of bacterial pathogens in sputum indicates a viral infection, but their presence does not rule it out.

OCCURRENCE. Worldwide. Incidence is highest in winter and spring in temperate zones.

INFECTIOUS AGENTS. A variety of viruses.

RESERVOIR. Man.

MODE OF TRANSMISSION. Direct contact with patients or carriers, droplet spread, and fomites.

INCUBATION PERIOD. From 10 to 14 days.

PERIOD OF COMMUNICABILITY. During the course of the illness.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general. Resistance is lower among older people and those with chronic cardiac or pulmonary disease.

TREATMENT. None, symptomatic.

METHODS OF CONTROL.

1. Practice good personal hygiene.
2. Avoid crowding in living quarters.
3. Eat an adequate diet.
4. Avoid fatigue and overexposure to a wet and cold environment.

PNEUMOCOCCAL PNEUMONIA

Pneumococcal pneumonia is the most common bacterial pneumonia. It is characterized by the sudden onset of a shaking chill with fever, chest pain, dyspnea, leukocytosis, and cough with "rusty" sputum. Pneumonia is often bronchial rather than lobar, especially in children. Sounds of lung consolidation and pleural rub may be heard.

Preliminary diagnosis is based on the above symptoms and chest X-ray, elevated WBC count, and demonstration of many gram-positive diplococci in sputum smears. It is confirmed by the isolation of pneumococci from blood or lower respiratory tract specimens.

OCCURRENCE. In all climates and seasons throughout the world, most often in the winter and spring in the temperate zones; more prevalent in infants and the aged.

INFECTIOUS AGENT. *Streptococcus pneumoniae* (pneumococci).

RESERVOIR. Man.

INCUBATION PERIOD. Not well determined, believed to be 1 to 3 days.

MODE OF TRANSMISSION. Direct oral contact with patients and carriers, droplet spread, or indirectly through various fomites.

PERIOD OF COMMUNICABILITY. Unknown; presumably until discharges of the nose and mouth no longer contain pneumococci.

SUSCEPTIBILITY AND RESISTANCE. Resistance is generally high but may be lowered by exposure, fatigue, alcoholism, chronic lung disease, or viral respiratory infection.

TREATMENT. Penicillin IM, oral penicillin V, or erythromycin under the direction of a medical officer. Supportive measures include bed rest and administration of fluids and analgesics.

METHODS OF CONTROL.

1. Good hygiene, including proper diet and rest.
2. Proper ventilation of living and working spaces.
3. Avoidance of unnecessary direct personal contact with infected persons.

ACUTE FEBRILE RESPIRATORY DISEASE

Viral diseases of the respiratory tract are characterized by fever, chills, headache or general aching, malaise, and anorexia. There may be rhinitis, sore throat, hoarseness, and cough. Symptoms and signs usually subside in 2 to 5 days without complications; infection may be complicated by other infectious agents or environmental factors.

Specific diagnosis requires isolation of the virus from respiratory secretions in appropriate cell or organ cultures or antibody studies of paired sera.

OCCURRENCE. Worldwide; seasonal in temperate zones, with greatest incidence during fall and winter and occasionally spring.

INFECTIOUS AGENTS. Numerous virus types.

RESERVOIR. Man.

MODE OF TRANSMISSION. Directly by oral contact or droplet spread; indirectly by articles freshly soiled by respiratory discharges of an infected person.

INCUBATION PERIOD. From a few days to a week or more.

PERIOD OF COMMUNICABILITY. For the duration of active disease.

SUSCEPTIBILITY. Universal; more frequent and severe in infants and children.

TREATMENT. None, symptomatic.

METHODS OF CONTROL.

1. Use oral live attenuated adenovirus vaccine. (Recruit training centers only).
2. Avoid overcrowding in living and sleeping quarters.
3. Personal hygiene education.

POLIOMYELITIS (Infantile Paralysis) (NAVMED P-5052-2)

Poliomyelitis is an acute viral illness whose symptoms include fever, malaise, headache, gastrointestinal disturbances, and stiffness of the back and neck. Severity ranges from inapparent infection to paralysis of the voluntary muscles, most commonly those of the lower extremities. Inapparent infections exceed clinical cases at least a hundredfold. The poliovirus invades the alimentary tract and can be isolated from feces or throat secretions early in the course of the infection.

OCCURRENCE. Worldwide. The clinical disease occurs sporadically and epidemically, but its incidence is usually higher in summer and early autumn. Before large scale immunization programs were carried out, the disease was more common in temperate zones.

INFECTIOUS AGENT. Poliovirus types 1, 2, and 3.

RESERVOIR. The reservoir is man, most frequently persons suffering from clinically unrecognized infections, especially children.

MODE OF TRANSMISSION. Direct contact with pharyngeal secretions or feces of an infected person or droplet spread; milk, in rare instances, has served as a vehicle.

INCUBATION PERIOD. From 3 to 21 days, commonly 7 to 21 days.

PERIOD OF COMMUNICABILITY. Communicability is at the maximum level 7 to 10 days before and after the onset of symptoms.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general, but few infected persons develop the paralytic disease. Type-specific resistance of long duration follows both clinical and inapparent infections.

TREATMENT. Under a medical officer's supervision, with attention during the acute phase of the illness to the complications of paralysis.

METHOD OF CONTROL. Vaccination with inactivated poliovirus vaccine or with live attenuated oral polio virus vaccine is recommended.

RABIES (Hydrophobia)

Rabies is an almost invariably fatal acute encephalomyelitis. Onset is with a sense of apprehension, headache, fever, malaise, and indefinite sensory changes. The disease progresses to paresis or paralysis, spasm of the muscles of swallowing, delirium, and convulsions. The usual duration is 2 to 6 days. Death is due to paralysis of the respiratory muscles.

OCCURRENCE. Primarily a disease of animals.

INFECTIOUS AGENT. Rabies virus.

RESERVOIR. Many wild and domestic animals.

MODE OF TRANSMISSION. Virus-laden saliva of a rabid animal introduced by a bite.

INCUBATION PERIOD. Four days to 1 year; median 35 days.

PERIOD OF COMMUNICABILITY. Usually for 3 to 5 days before onset of clinical signs, and during the course of the disease.

SUSCEPTIBILITY. Most warm-blooded animals are susceptible.

TREATMENT. A combination of passive and active immunization is recommended for treatment of ALL BITES by animals suspected of having rabies. See BUMEDINST 6220.6 for use of Rabies Immune Globulin and Duck Embryo Vaccine.

METHODS OF CONTROL.

1. Vaccination of dogs.
2. After the bite of an animal with suspected rabies, immediately and thoroughly cleanse the wound with soap and water, or detergent and water, or quarternary ammonium compounds. Rinse thoroughly. Under a medical officer's direction, give antirabies serum and vaccine, as indicated. If necessary, give tetanus prophylaxis and antibacterial treatment. Do not suture or close the wound unless unavoidable.
3. Preexposure prophylaxis is advisable for high risk individuals such as veterinarians and animal handlers.

RINGWORM

Ringworm of the scalp (tinea capitis) begins as a small papule spread peripherally, leaving a small area of baldness. Infected hairs become brittle and break off easily.

Ringworm of the body (tinea corporis) affects cutaneous areas other than the scalp, bearded areas, and feet. The periphery is reddish, vesicular or pustular, and may be dry and scaly or moist and crusted. As the lesion progresses peripherally, the central area often clears and the skin appears normal.

Ringworm of the foot (tinea pedis) causes scaling and cracking of the skin. The area between the toes is especially susceptible and may reveal blisters containing a thin, watery fluid so characteristic that most laymen recognize the condition as "athlete's foot."

Ringworm of the nail (tinea unguium) is a chronic infection involving one or more of the nails of the hand or foot. Either the nail gradually thickens, discolors, becomes brittle, and has caseous-appearing material form beneath it, or it becomes chalky and disintegrates.

OCCURRENCE. Worldwide.

RESERVOIR. Man.

MODE OF TRANSMISSION. Direct contact with reservoirs or sources of infection such as skin lesions of infected persons, contaminated floors, shower stalls, and other articles used by infected persons.

PERIOD OF COMMUNICABILITY. As long as infected lesions are present or as long as viable spores are present on contaminated materials.

SUSCEPTIBILITY AND RESISTANCE. Children are very susceptible to tinea capitis. Susceptibility to tinea corporis is general. Susceptibility to tinea pedis and tinea unguium is variable and recurrences are frequent.

TREATMENT. Application of effective topical fungicides. Systemic therapy may be indicated in severe cases and is the treatment of choice for tinea unguium.

METHODS OF CONTROL.

1. Tinea capitis:

a. Public education to curb the spread of the disease and to avoid contact. Surveillance of children for signs of the disease.

b. Effective control of ringworm in animals and avoidance of infected animals.

2. Tinea corporis, t. pedis, t. unguium:

a. Proper laundering (with sterilization) of towels and clothing; general cleanliness in showers and dressing room of gyms, especially repeated washing of benches.

b. Use of fungicidal agent to disinfect benches and floors, plus frequent hosing of shower areas.

c. Good personal hygiene.

STREPTOCOCCAL DISEASES CAUSED BY GROUP A (Beta Hemolytic) STREPTOCOCCI (NAVMED P-5052-17)

Streptococcal sore throat exhibits characteristics which may include fever, sore throat, exudative tonsillitis or pharyngitis, tender cervical adenopathy, and leukocytosis. Injection and edema of the pharynx frequently involve the tonsilar pillars and soft palate, often extending on to the hard palate; petechiae are occasionally seen against the background of diffuse redness. Lack of tonsilar exudate does not rule in or out the diagnosis of streptococcal sore throat.

Scarlet fever is a form of streptococcal disease that includes a skin rash. It occurs when the infecting strain of streptococcus is a good toxic producer and the patient is not immune to the toxin. The clinical symptoms are those of a streptococcal sore throat, as well as enanthem, strawberry tongue, and exanthem. The rash is usually a fine erythema, commonly punctate, blanching on pressure, and appearing most often on the neck, chest, in folds of the axilla, elbow, and groin.

Provisional laboratory diagnosis of group A streptococcal disease is based on morphology of colonies and production of clear or beta hemolysis on blood agar. Definitive diagnosis depends on specific grouping procedures.

OCCURRENCE. Common in temperate zones. Apart from food-borne epidemics, which may occur in any season, the highest incidence is in late winter and spring.

INFECTIOUS AGENT. *Streptococcus pyogenes.*

RESERVOIR. Man.

MODE OF TRANSMISSION. Primarily by direct or intimate contact with a patient or carrier.

INCUBATION PERIOD. Short, usually 1 to 3 days.

PERIOD OF COMMUNICABILITY. From 10 to 21 days in untreated uncomplicated cases. Adequate treatment with penicillin will eliminate the probability of transmission within 24 hours.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general, although many persons develop either antitoxin or type-specific antibacterial immunity, or both, through inapparent infection.

TREATMENT. Penicillin or erythromycin under a medical officer's direction.

METHODS OF CONTROL.

1. Avoidance of infected person.
2. Chemoprophylaxis with penicillin for persons for whom infection constitutes a special risk, such as individuals who have had rheumatic fever, chorea, or recurrent erysipelas.
3. Boiling or pasteurization of milk.
4. Exclusion of infected or suspected personnel from food handling.

STAPHYLOCOCCAL INFECTIONS (NAVMED P-5052-16)

Staphylococci are found in the nostrils and on the skin of many persons. Penicillin-resistant strains are often found in medical environments. They are known to be responsible for neonatal infections, breast abscesses in nursing mothers, postoperative infections, furuncles and carbuncles, along with staphylococcal pneumonia, bacteremia, osteomyelitis, and enterocolitis.

Diagnosis is based on symptoms, infection site, and laboratory results.

OCCURRENCE. Worldwide.

INFECTIOUS AGENT. Various coagulase-positive strains of *Staphylococcus aureus*.

RESERVOIR. Man is the reservoir. Lesions and discharges from the nose and throat of infected persons are the source.

MODE OF TRANSMISSION. From 30% to 40% of the population carry *S. aureus* in their anterior nares. Autoinfection is responsible for one third of all infections. Transmission also occurs by contact with a person who has a purulent lesion or who is an asymptomatic carrier. In hospitals, transmission from patient to attendant to patient is the most common mode.

INCUBATION PERIOD. Variable and indefinite. Commonly 4 to 10 days.

PERIOD OF COMMUNICABILITY. Until lesions have healed. Asymptomatic nasal carriers normally are allowed to have normal patient contact but are reminded to be especially careful of droplet spread and general personal hygiene.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general, but certain groups of patients are predisposed to staph infections. These include people with chronic respiratory problems, leukemia, tracheostomies, burns, chronic skin disorders, surgical incisions, diabetes, indwelling catheters, and the newborn.

TREATMENT. In localized skin infections systemic antibiotics are not usually indicated. For serious staphylococcal infections, penicillinase-resistant penicillins are used under the direction of a medical officer.

METHODS OF CONTROL.

1. Good personal hygiene; avoid common use of toilet articles.
2. Scrupulous attention to aseptic precautions.
3. Infected people should avoid contact with infants and debilitated persons.
4. Prompt treatment of initial cases.
5. Concurrent disinfection of dressings from open lesions and of discharges.

TETANUS (Lockjaw)

Tetanus is an acute disease caused by toxin of the tetanus bacillus growing anaerobically at the site of an injury. Tetanus is characterized by painful muscular contractions, principally the masseter and neck muscles; the trunk muscles are sometimes affected. Rigidity is occasionally confined to the region of the injury, but abdominal rigidity is often a common first sign suggestive of tetanus.

OCCURRENCE. Worldwide. It is sometimes seen in farmers in the central United States, especially following wound contamination with manured soil. More common in underdeveloped and in agricultural areas of the world.

INFECTIOUS AGENT. *Clostridium tetani*, the tetanus bacillus.

RESERVOIR. Man and domestic animals, especially horses. The sources of infection are soil, street dust, and animal or human feces.

MODE OF TRANSMISSION. Tetanus spores enter the body through sites of injury, usually a puncture wound.

INCUBATION PERIOD. From 4 days to 3 weeks or more, depending on the character and extent of the wound.

PERIOD OF COMMUNICABILITY. Not directly transmissible from human to human.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general, but it is especially high among drug addicts and victims of serious burns and wounds. Prolonged active immunity is induced by tetanus toxoid; transient passive immunity follows injection of tetanus immune globulin (human) or tetanus antitoxin.

TREATMENT. Under a medical officer's supervision: Tetanus immune globulin (human) IM in large doses; tetanus antitoxin in a single large dose IV; penicillin in large doses IM. Active immunization should be initiated concurrently with therapy.

METHODS OF CONTROL.

1. Education of general public regarding the type of wound conducive to tetanus.
2. Active immunization with tetanus toxoid.
3. Booster shots when injuries occur.

TUBERCULOSIS (NAVMED P-5052-20)

Tuberculosis is a chronic bacterial infection that presents variable symptoms, including fever, cough, loss of weight and appetite. Other symptoms are increasing sputum, hemoptysis, chest pain, and dyspnea.

OCCURRENCE. Worldwide. In the U.S. incidence increases with age and is highest among males and nonwhites.

INFECTIOUS AGENT. *Mycobacterium tuberculosis* and *M. bovis*.

RESERVOIR. The reservoir is man or diseased cattle.

MODE OF TRANSMISSION. Direct contact, droplet spread, or fomites from sputum of infected persons, or from exposure to tuberculous cows usually by ingestion of unpasteurized milk or dairy products.

PERIOD OF COMMUNICABILITY. As long as bacilli are discharged by the patient.

INCUBATION PERIOD. From infection to demonstrable primary lesion, about 4 to 12 weeks; to progressive pulmonary or extrapulmonary tuberculosis may be years.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general. Highest in children under 3 years; undernourished, neglected, and fatigued persons; and in areas with low standards of living.

TUBERCULIN SKIN TEST. This test is administered to those who enter or separate from the Navy and annually to all personnel as part of the Navy's Tuberculosis Control Program. All hospital corpsmen should become familiar with BUMEDINST 6244.1 series, which is the basic instruction covering this program.

A tuberculin skin test, known as the Mantoux test, uses a syringe and needle to inject purified protein derivative (PPD) of tuberculin intradermally. Only trained Medical Department personnel are authorized to perform this test. Reaction to PPD indicates exposure to the tubercle bacillus but not necessarily active disease. Persons who react to PPD with an area of induration of 10 mm or more have a much greater risk of developing clinical tuberculosis than those who do not react and must have standard X-ray examination of the chest.

TREATMENT. Under the direction of a medical officer.

METHODS OF CONTROL.

1. Health education of the general public and improved living conditions.
2. Isolation and hospitalization of active cases.
3. Identification of cases of TB through skin testing and chest X-ray.
4. Proper management of PPD converters, including treatment with isoniazid (INH).

TYPHOID FEVER (Enteric Fever)

Typhoid fever is a systemic infection characterized by persistent fever, headache, malaise, anorexia, rose spots on the trunk, lymphoid tissue involvement, enlargement of the spleen, and constipation more often than diarrhea.

OCCURRENCE. Widespread throughout the world. Incidence is much higher in rural than in urban areas. The disease is still common in the Far East, Middle East, Eastern Europe, Central and South America, and Africa, but sporadic in the U.S.

INFECTIOUS AGENT. *Salmonella typhi*, the typhoid bacillus.

RESERVOIR. Man, both patients and carriers.

MODE OF TRANSMISSION. By food or water contaminated by feces or urine of a patient or carrier. Flies can be important vectors.

INCUBATION PERIOD. Dependent on size of infecting dose, usually 1 to 3 weeks.

PERIOD OF COMMUNICABILITY. As long as typhoid bacilli are present in excreta, usually from the development of symptoms throughout convalescence, thereafter variable. From 2% to 5% of the patients become permanent carriers.

SUSCEPTIBILITY AND RESISTANCE. Susceptibility is general but is increased in individuals with gastric achlorhydria. Resistance to small infecting doses follows recovery from clinical disease or from inapparent infections or from active immunization. In endemic areas attack rates usually decline with age.

TREATMENT. Under a medical officer's supervision. Chloramphenicol is the agent of choice. Ampicillin may be useful for strains resistant to chloramphenicol.

METHODS OF CONTROL.

1. Purification, chlorination, and protection of water supply.
2. Sanitary disposal of human excreta.
3. Fly control by screening and spraying.
4. Boiling or pasteurization of milk.
5. Control of shellfish marketing.
6. Strict supervision of food preparation facilities.
7. Examination of food handlers.
8. Discovery, treatment and supervision of carriers.
9. Immunization.

SEXUALLY TRANSMITTED DISEASES (Venereal Diseases) (NAVMED P-5052-11)

Sexually transmitted diseases in their many forms are among the most common communicable diseases. Because of embarrassment or lack of education, a great many cases go unreported and untreated. Changes in sexual behavior and the fact that many people are asymptomatic carriers have added to the problems of control.

As a hospital corpsman you will have the responsibility of recognizing cases of sexually transmitted disease in the sick-call environment, initiating laboratory procedures to confirm the diagnosis, and educating personnel in recognizing the signs of sexually transmitted disease and the best ways to avoid infection.

This section will deal with four of the most common types of sexually transmitted diseases: gonorrhea, nongonococcal urethritis, syphilis, and genital herpes. There are many other forms of sexually transmitted diseases that you should become familiar with. Current medical journals are a good source of information, along with current naval texts and instructions.

GONORRHEA
(Gonococcal Urethritis, Clap, Strain)

Gonorrhea is an infectious disease of the epithelium of the urethra, cervix, and rectum, which may also affect other areas of the body. In males the first symptom is a tingling sensation in the urethra, which is soon followed by a purulent, yellow-green discharge, usually 2 to 9 days after exposure. The meatus may be red and swollen. In females symptoms are slight or nonexistent (up to 60% may be asymptomatic). Some discharge may be noted. In either sex perianal discomfort and rectal discharge may be symptoms of rectal involvement. Gonococcal pharyngitis will lead to complaints of sore throat and discomfort in swallowing. The pharynx and tonsils may be red and covered with exudate.

Diagnosis is based on symptoms, personal history, or sexually transmitted disease contact referral. Diagnosis is confirmed by identification of the gonococcus through gram-stained smears and exudate specimen cultures. In females, repeated cervical and rectal cultures may be necessary to detect residual infection.

OCCURRENCE. Worldwide.

INFECTIOUS AGENT. *Neisseria gonorrhoeae*, the gonococcus.

RESERVOIR. Man.

MODE OF TRANSMISSION. Sexual contact with an infected person.

INCUBATION PERIOD. From 2 to 9 days or longer.

PERIOD OF COMMUNICABILITY. While the infection is present.

SUSCEPTIBILITY. General

TREATMENT. Under the supervision of a medical officer. Aqueous procaine penicillin G IM in 2 injections (2.4 million units each, 4.8 million units total) at one visit, immediately preceded by 1 g of oral probenecid. Organisms resistant to penicillin therapy will require treatment with Spectinomycin (See current BUMED Note 6222 and NAVMED P-5052-15A).

METHODS OF CONTROL.

1. Education of personnel as to the dangers of indiscriminate sexual contact; use of prophylactics and personal hygiene to minimize the chance of infection; and recognition of symptoms.
2. Referral of patients to a trained sexually transmitted disease contact interviewer for followup on contacts.

NONGONOCOCCAL URETHRITIS

Nongonococcal urethritis is a sexually transmitted urethritis of males not associated with the gonococcus. Clinical manifestations are either indistinguishable from gonorrhea or somewhat milder and include opaque discharge, urethral itching, dysuria, and burning on urination. Nongonococcal urethritis is usually diagnosed by failure to demonstrate *N. gonorrhea* by repeated smear or culture.

OCCURRENCE. Worldwide.

INFECTIOUS AGENT. *Chlamydia trachomatis* has been identified in 50% of the cases.

MODE OF TRANSMISSION. Sexual intercourse.

INCUBATION PERIOD. Thought to be 5 to 7 days or longer.

TREATMENT. Under a medical officer's supervision, 0.5 g tetracycline 4 times daily by mouth for at least 7 days.

METHODS OF CONTROL.

1. Health and sex education.
2. Good sex hygiene.

SYPHILIS

Syphilis is a contagious disease that can attack any organ in the body and is characterized by periods of active manifestations and symptomless latency. It can be passed from mother to unborn child.

There are three stages of this disease, which can be divided into other substages of infectiousness and latency. Primary syphilis is the stage when the primary lesion (chancre) appears. Secondary syphilis follows close behind and is characterized by skin disorders that may mimic other dermatological problems. Tertiary syphilis follows a latent period of two or more years. Diagnosis is by symptoms, sexually transmitted disease contact referral, personal history, serologic tests (STS), darkfield examination, and any other laboratory tests a medical officer may deem appropriate.

OCCURRENCE. Worldwide.

INFECTIOUS AGENT. *Treponema pallidum*, a spirochete.

INCUBATION PERIOD. Ten days to 10 weeks, usually 3 weeks.

RESERVOIR AND SOURCE OF INFECTION. Man is the reservoir. The sources of infection are spirochetes in the host's genitourinary system, and lesions.

MODE OF TRANSMISSION. By direct contact in sexual intercourse and kissing. Invasion of the body is through mucous membranes or skin abrasions.

PERIOD OF COMMUNICABILITY. Variable and indefinite. During primary and secondary stages and also in mucocutaneous recurrence; may be intermittently communicable for 2 to 4 years. Adequate penicillin treatment usually ends infectivity within 24 hours.

TREATMENT. For primary and secondary syphilis, under a medical officer's supervision, 2.4 million units of benzathine penicillin G, given IM (can be divided into two doses and injected into different sites at one visit). Erythromycin or Tetracycline may be given to pencillin-sensitive patients.

METHODS OF CONTROL. Personal hygiene and sex education.

HERPES GENITALIS

Herpes genitalis is a contagious infection of the genital skin and mucosa. It is currently the most common form of genital ulceration. Symptoms begin with itching and soreness, which are soon followed by the appearance of circular ulcers on genitourinary surfaces. Complaints include pain, malaise, and difficulty in micturating and walking. Diagnosis is by symptoms and laboratory analysis of lesion serum.

OCCURRENCE. Worldwide.

INFECTIOUS AGENT. *Herpesvirus hominis*, Type 2.

RESERVOIR. Man.

INCUBATION PERIOD. From 4 to 7 days.

TREATMENT. There is no cure. Lesions will crust over and heal in about 10 days. Until this happens keep the lesion clean with saline irrigations twice daily. Analgesics may be required for pain. The infection may recur.

METHODS OF CONTROL. Personal hygiene and health education.

HEALTHFUL LIVING ASHORE AND AFLOAT

As a Medical Department representative you will often be called upon to help ensure that all hands have healthful living conditions, both ashore and afloat. This manual gives only a rough outline of your responsibilities. To perform adequately in this area you must become familiar with the BUMED Instructions in the 6200 series; the Manual of Naval Preventive Medicine (NAVMED P-5010); and other applicable manuals and publications that may be referenced or become available to you.

FOOD SANITATION

Food-borne illnesses are an ever-present danger in the military environment. They pose a real threat to the health and morale of our personnel. To prevent their occurrence, care must be taken to ensure that all foods are procured from approved sources and processed, prepared, and served with careful adherence to recommended sanitary practices. The majority of food-borne illnesses can be traced to food that has been prepared too far in advance; inadequate refrigeration; disregard for temperature and time factors; or food service personnel who ignored or are inadequately trained in food handling techniques. These points need be kept in mind and stressed during inspections of food service facilities.

Health Standards for Food Service Personnel

Food service personnel are a most important link in the transmission of disease through foods. Their health, personal habits, and methods of preparing and serving food are vital factors in maintaining the health and well-being of all hands.

All food service personnel (military and civilian) shall be examined and determined to be free from communicable disease prior to initial assignment in food service. The physical exam shall be comprehensive enough to detect acute or chronic disease. Laboratory tests shall be accomplished at the discretion of the senior medical officer. All food service personnel must be examined for evidence of tuberculosis in accordance with BUMEDINST 6224.1 series and the Manual of Naval Preventive Medicine, NAVMED P-5010.

Personnel having open lesions, particularly of the hands, face, or neck, or acne of the face, shall be prohibited from performing food service duty.

Examinations of personnel with questionable social or medical histories shall be comprehensive and include X-rays of the chest; stool and urine examinations for parasites and bacteriologic pathogens; and such other laboratory tests and physical determinations as may be indicated.

All food service personnel who have been away from their duties for 30 days or more for nonmedical reasons or for any period of time for medical reasons must receive a medical examination prior to resumption of their food service duties.

Training and Hygiene

All food service personnel shall be thoroughly indoctrinated in personal hygiene and food sanitation, as well as in the methods and importance of preventing food-borne illness. The requirement for food service training is specifically addressed in SECNAVINST 4061.1 series. All food personnel are required to have a minimum of 6 hours initial training and 3 hours refresher training in food service sanitation principles. Evidence of completion of this training is maintained on the Foodservice Training Certificate (NAVMED 4061/1), which is to be kept on file by the food service officer at the work location. These records must be verified by supervisory and Medical Department personnel during routine sanitation inspections.

All food service personnel shall be physically clean and shall wear clean garments when working in food service areas. Caps or hairnets that completely cover the hair shall be worn at work. If a beard is worn, it shall be completely covered. Personnel shall keep their nails clean and trimmed short, and special attention shall be directed to the cleanliness of hands. Adequate and convenient hand-washing facilities with hot and cold running water, soap, and disposable towels shall be provided. Personnel shall be instructed to wash their hands with soap and potable water before assuming duty and always after using rest rooms. Conspicuous signs to this effect will be posted. Tobacco will not be used in any form in the scullery or food preparation/service areas.

VECTOR AND ECONOMIC PEST CONTROL

The term vector is used to refer to all insects, rodents, and related animals that play a significant role in the transmission of disease to man, act as intermediate hosts or reservoirs of disease, present problems of sanitary or hygienic significance, or otherwise affect the health and efficiency of personnel.

Elimination or control of insect vectors and pests detrimental to the health, morale, and habitability of shipboard and shore environments is the responsibility of the Medical Department representative. The Manual of Naval Preventive Medicine is the guide to correct and safe vector and pest control, but it will be almost useless unless you have practical experience in the following areas:

1. Conducting periodic surveys to detect the presence of vectors and other pests. Inadequate control programs are due, in part, to a lack of proper monitoring programs.

2. Evaluating sanitation and supply practices that may affect the presence of vectors and pests or the effectiveness of control methods.

3. Supervising vector control efforts for effectiveness and compliance with all current pesticide regulations and directives. Ensure that pesticides are safely applied and stored according to label requirements.

See Table 11-1 for more information on commonly encountered pests and Table 11-2 for information on the control of arthropod disease vectors.

Entomological Services

Specially trained and qualified personnel are available to assist the Medical Department with vector problems. Preventive medicine technicians and medical entomologists are available on a regional or area level for utilization by commands with significant vector problems. Refer to BUMED Instructions 6200.1, 6200.3, 6200.9, and 6250.6 series for location and availability of pest control personnel and assignment of responsibilities. Pesticide recommendations are published in the "Recommendations for Chemical Control of Disease Vectors and Economic Pests", available from either Disease Vector Ecology and Control Center.

Training and Certification

Scheduled training programs are available to corpsmen assigned to shipboard pest control. This training, as required by BUMEDINST 6250.13 series, presents techniques and precautions for the application of pesticides aboard ship. The senior enlisted Medical Department representative and the corpsman responsible for pest control must be recertified annually.

Only Medical Department personnel who have successfully completed the 1-day course and one half day OJT will be certified in accordance with BUMEDINST 6250.12 series. Certified personnel are qualified to procure standard stock pesticides approved for use aboard ship and to conduct shipboard pest-control programs.

Pesticide dispersal and other pest-control operations at shore installations must be performed by or under direct and continuing supervision of trained and certified personnel, as set forth in NAVFACINST 6250.5 series.

Department of Defense Standards

Noncontrolled (ready-to-use) general-use pesticides are available from the DOD section of the Federal Supply catalog (FSC), Group 68, Chemicals and Chemical Products. These ready-to-use, unrestricted items are stocked especially for ships and small activities and are requisitioned through normal procurement channels.

When ready-to-use items do not provide adequate control, or where there is any doubt that available personnel are qualified to supervise their application, medical officers or senior enlisted corpsmen should request assistance of an entomologist.

Table 11-1.—Guide for Commonly Encountered Pests

Pests	Importance	Characters/Biology	Survey	Control
Cockroaches	Morale Factor; contaminate food	German: small light brown with 2 dark stripes on dorsum of thorax; omnivorous; nocturnal; inhabit cracks and crevices 3/16" or less in width	Flush harborages every 2 weeks with pyrethrin or resmethrin aerosol and 1% Baygon	Excellent sanitation supplemented with chemical control
Rodents	Serve as hosts for plague and murine typhus vectors; poison food; contaminate and eat stored foods	Norway rat: stout body, blunt nose, tail shorter than body, brown Roof rat: slender body, pointed nose, tail longer than body, black to gray House mouse: small and slender, tail longer than body	Look for gnawing on food packages, nests, rub marks, tracks, droppings, live or dead rodents, odors	Prevent entry with metal rat guards; provide minimum access to food and shelter; use rat traps indoors and rodenticides outdoors
Stored Products Pests	Over 100 species of moths and beetles exist; infest stored goods, creating economic loss; morale factor	Small, photophobic; rapid breeding; prefer confined areas with high temperature and humidity	Inspect incoming goods for holes, feces, webbing, cast skins, live or dead insects; inspect seams and flaps of packages in storerooms periodically	Remove infested goods; clean up all spills; rotate stock; maintain good sanitation; insecticide treatment. Keep high infestibles (cornmeal, grits, farina) in the chill box or freezer
Crab lice	Ectoparasites; morale factor	Small, whitish; abdomen very short; large 2nd and 3rd pair of legs give crablike appearance	Found on pubic hairs, also on hairs of chest, armpits, eyebrows, and beard; eggs (nits) found glued to body hairs	Kwell ointment (1% lindane); 1% malathion dust; segregation of infested personnel

Table 11-2.—Control of Arthropod Disease Vectors

Vector	Disease Transmitted	Control Methods	Personal Protective Methods
Mosquitoes	Malaria filariasis dengue fever encephalitides yellow fever	Water control; surveys; larvaciding; fogging	Repellents; bed nets; long sleeves at night; chemoprophylaxis for malaria; vaccination for yellow fever
Flies	Dysentery salmonellosis cholera typhoid	Proper disposal of feces and garbage; residual and space sprays; screening rest rooms and galleys	Personal hygiene
Fleas (and rodents)	Plague murine typhus	Flea control with insecticide prior to rodent control; rodenticides	Individual use of insecticide powder; blousing of trouser legs into boots without metal or rubber bands
Body lice	Louse-borne typhus relapsing fever	Proper laundry service	Individual use of insecticide powder; segregation of infested personnel; personal hygiene
Ticks	Spotted fever tick paralysis tick-borne typhus	Weed and underbrush control where practical; area application of pesticides	Repellents; proper blousing of trousers
Mites	Scrub typhus hemorrhagic fevers	Rodent, weed, and underbrush control	Repellents and clothing; acaricides

Certain pesticides classified as restriced or controlled items are nonstandard materials that may be issued only upon approval of the Surgeon General or his designated representatives. Requisitions for these shall be forwarded through proper channels via the appropriate area entomologist.

Pesticide Hazards

Before using a pesticide, read the instructions on the label. Do not rely on memory. With reasonable precautions most pesticides can be handled and used without undue hazard.

Since all pesticides are considered potentially harmful to humans to some degree, certain basic precautions must be practiced. Regardless of the material used, it is standard procedure to protect food, cooking utensils, and food preparation surfaces and to avoid continued human exposure to pesticidal fogs, sprays, and dusts.

Protective equipment and clothing must be worn to protect all parts of the body from pesticidal contamination. These items should be stored in a separate area, away from the pesticides. Always read the label for recommendations on the use of protective clothing and devices.

Wear an OSHA-approved respiratory device to prevent inhalation of pesticides. Specific types of cartridges and cannisters protect against specific chemical gases and vapors. Change the cartridges after every 8 hours of use or whenever you detect odors.

Wear goggles or a face shield to prevent contamination of the eyes with pesticides. A long-sleeved shirt and full-length trousers or coveralls (all of closely woven fabric) should be worn when pesticides are handled. A lightweight raincoat or rubber apron and liquid-proof solvent-resistant gloves should be worn when handling pesticide concentrates or very toxic materials. Trousers should be worn outside of lightweight rubber boots to prevent pesticides from getting inside the boots. A clean set of clothing should be worn daily. If clothes get wet during dispersal, change them immediately. Wash contaminated clothing separate from other clothing. Always wear something to protect the head. Always shower after completing pest-control operations.

Pesticide Storage and Transportation

Maintain a current listing of all pesticides in storage and keep it readily available for emergency use. The list should include the following information:

1. Manufacturer or distributor
2. Chemical name or group
3. Concentration
4. Type of formulation
5. Toxicity
6. Flashpoint
7. Type of container
8. Quantity

Inform the Medical Department of the potential for pesticide poisoning so that proper antidotes are made available. Security should be informed to make them aware of the hazards in pesticide areas. The storage area must be locked in the absence of trained personnel.

Storage areas should have deluge washing and fire-fighting capabilities and provisions to contain spills and decontaminate the area. Post written safety procedures to be followed in the case of pesticide spills.

The storage area should be dry, cool, insulated, and out of direct sunlight. It should be constructed of fire-resistant materials and have good lighting and a continuously operating exhaust fan. It should also be liquid-tight, with a raised sill or floor at least 4 inches below the surrounding floor. Openings must have approved self-closing fire doors. Smoking and eating are never permitted in a pesticide handling area. Appropriate warnings should be posted and enforced.

The user of pesticides is legally responsible for their safe transportation after purchase and possession. Carry pesticides in the back of a truck, never in a cab. They should be securely fastened, enclosed, and locked to prevent spillage and contamination of personnel and equipment. Special precautions must be taken for paper containers to protect them from moisture damage. Apropriate signs should be secured on the vehicle to warn of the potential hazard.

CONTROL OF INSECTS AND CARRIERS

FLIES. Flies transmit many human and zoonotic diseases that may seriously hamper military activities. In addition, virtually all fly species can be annoying pests. One of the most serious of these pests is the house fly, which is capable of transmitting disease-producing organisms via its vomitus and excrement and on its contaminated feet, body hairs, and mouthparts. Chief among these organisms are those of cholera, dysentery, and typhoid fever. All flies have two wings and four major developmental stages (eggs, larva, pupa, and adult).

Control of domestic flies depends upon improved environmental sanitation in conjunction with selected application of insecticides. With proper sanitation, less dependence need be placed on insecticides. Any fermenting or decaying organic matter, including human and animal feces, dead animals, fish and meat refuse, and discarded food stuffs are potential breeding places for flies. Prevention of fly breeding and entry into buildings reduces the potential for disease transmission.

Proper disposal of food service wastes, including all garbage and liquids such as wash water, reduces the attraction of flies to dining facility areas. Garbage should be deposited in containers with tight-fitting lids, which should be washed regularly. These containers should be kept outside of dining facilities, preferably off the ground, on a stand or rack.

For troops in the field, short-term control of flies by chemicals may be the only practical method. Larviciding usually is not practical in large operations, because breeding places are too scattered for effective treatment. However, this method is indicated in areas of concentrated breeding, such as garbage handling zones, compost piles, and carcasses. In all larvicidal treatments emphasis must be placed upon getting the insecticide to the site where it can act on the larvae. Extensive reliance on larviciding, however, should be avoided since it probably precipitates the development of resistance. Where latrine contents are relatively dry, fly breeding can be controlled by sprinkling paradichlorobenzene (PDB) over the pit surface at a rate of approximately 2 ounces (59.15 ml) per latrine per week. This treatment is effective only when pits are deep, dry, and unventilated.

Application of residual insecticides to areas of fly congregation may be necessary to provide an additional level of control. The surface areas to be treated include resting places in buildings, such as overhead structures, hanging cords, moldings, and door/window facings. Several insecticides from the Federal Supply Catalog can be applied as selective spot treatments and will provide good indoor control for about 1 week. Residual insecticides may be applied to resting places such as building exteriors near breeding sites, open sheds, garbage cans, shrubs, and low trees by means of spray equipment with a fan-type nozzle, paint brushes, or rollers. Spray to the point of runoff and avoid contamination of food or utensils. Do not permit personnel or utensils to contact wet treated surfaces.

Miscellaneous control methods include screens with an 18- by 18-inch mesh, (50.8 x 50.8 cm) high velocity fans over doorways, self-closing doors, and fly paper.

MOSQUITOES. Mosquitoes rank first in importance among insects that transmit disease to man. The genera most frequently associated with disease transmission are *Aedes*, *Anopheles*, and *Culex*. *Anopheles* mosquitoes transmit malaria. Dengue is transmitted only by *Aedes* mosquitoes. The common mosquito, *Aedes aegypti*, transmits yellow fever. Several genera, including *Culex*, transmit the worms that cause filariasis. The causative agent of encephalomyelitis is also transmitted by mosquitoes. Besides being disease-bearing agents, many species of mosquitoes are serious pests to man because of the irritation caused by their bite.

Mosquitoes deposit their eggs on the surface of water or on surfaces subject to flooding. Larvae hatch and feed on organic matter in the water, pupate, and eventually change into adults. Only the females feed on blood.

Mosquito-control methods are classified as either permanent or temporary, depending on whether they are designed to eliminate breeding areas (source reduction) or simply to kill the present population. Permanent mosquito-control measures are considered in detail in NAVFAC MO-310.

Control of mosquito breeding is accomplished by the following means:

1. Simple draining of impounded water;
2. Filling in low spots;
3. Adding mosquito-eating fish *(Gambusia)* to larger permanent bodies of water;
4. Removing or burying small artificial containers (cans, tires, or other water-holding receptacles); or
5. Using larvicidal insecticides, which may be in the form of liquids, dusts, or granules. The use of granules is indicated to penetrate dense vegetation or to prevent possible damage to crops (e.g., rice). OPNAVINST 6240.3 series defines the limited use of aircraft for insecticide dispersal.

Adult mosquitoes may be controlled by application of residual and space sprays. Indoors, space sprays are recommended for immediate control. Treatment with a standard aerosol dispenser should be at a rate of 7 seconds of discharge per 1,000 cubic feet (28.317 cubic meters) of space. This will have little or no residual effect.

Aerosols or mists are used for outdoor control of adult mosquitoes in addition to treatment of breeding sources. Aerosols are considered desirable in preventing annoyance by mosquitoes in limited bivouac areas. Aerosol operations should be accomplished when wind speeds are less than 6 knots and when target species are active. Residual sprays have limited applicability for the protection of small camps. When used, the spray is applied to all vegetation surfaces for an area of 30 meters (32.8084 yds) or more around the place to be protected. Additional protective measures include screening living quarters, personal protection with insect repellents, and locating camps away from standing water and native villages to avoid contact with potentially infected mosquitoes.

LICE. The infestation of the hairy parts of the body with lice is called pediculosis. Human lice are responsible for the transmission of louse-borne typhus, trench fever, and louse-borne relapsing fever. Louse-borne typhus is one of the few insect-transmitted diseases for which man serves as the reservoir. Trench fever is thought to be related to typhus fever. It does not kill, but it can be a debilitating epidemic disease among louse-infested troops. Louse-borne relapsing fever is caused by a spirochete, and although it is found throughout the world, it is most prevalent in parts of Europe, North Africa, and Asia. In addition to serving as a vector of these serious diseases, lice cause a great deal of misery for infested people. Human louse species do not normally infest animals.

Three types of lice infest man: the body louse, *Pediculus humanus corporis*; the head louse, *P. humanus capitis*; and the crab louse, *Phthirus pubis*. The body louse is found on the body and along the seams of undergarments. The head louse is found on the head and neck, clinging to hairs. The eggs of the body louse are attached to fibers of underclothing, whereas the eggs (nits) of the head louse are firmly attached to the hair. Head and body lice are normally acquired by personal contact, by wearing infested clothing, or by using contaminated objects such as combs and brushes.

Crab lice usually infest the pubic and anal regions, but occasionally also the eyebrows, armpits, and other areas of the body. These insects feed intermittently for many hours at a time and are unable to survive more than a short time away from the host. Crab lice are spread mainly by physical contact during sexual intercourse.

Control of lice includes delousing of individuals, treatment of infested clothing, bedding, living areas, and toilet facilities, and the prevention of new infestations. Louse-control measures should be coordinated with a medical officer. The following preventive measures should be taken, especially during crowded shipboard and tenting conditions:

1. Treat louse-infested individuals and materials immediately.
2. Encourage personal cleanliness, i.e., frequent showers with soap and water and clothing changes (particularly underclothing).
3. Avoid overcrowding of personnel.
4. Instruct personnel on the detection and prevention of louse infestation.

Individual louse-treatment measures include dusting with louse insecticide powder issued in a 2-ounce (56.699 gms) shaker can.

For prevention or treatment of body louse infestations, wash all clothing and bedding in hot water and repeat in 7 to 10 days. If washing of clothes is not practical because of travel or combat, application of an insecticidal dust is recommended. Dust the entire surface of the underwear and any other clothing worn next to the skin, including the shirt, as well as along the seams of outer garments. Rub the treated clothing lightly to spread the powder. About 30 grams (1.07 oz) of insecticide per person is required. If clothing cannot be conveniently removed, unbutton the shirt and trousers and dust the powder liberally on the inside of the underwear and other garments next to the skin. Then pat the clothes by hand to ensure distribution of the powder. Toilet facilities, along with extra clothing and bedding, should also be dusted.

For head lice, apply the powder lightly to the hair and rub it in with the fingertips. Do not wash the hair for at least 24 hours. Second and third applications at weekly intervals are necessary to kill new lice hatching from the nits. Insecticidal shampoos are also effective.

For crab lice, apply the powder thoroughly to all regions of the body having a moderate to heavy growth of hair. Do not bathe for at least 24 hours. One or two repeat treatments at 10-day intervals may be necessary. Insecticidal ointments and shampoos are also effective in controlling crab louse infestations.

BEDBUGS. Bedbugs are occasional pests aboard ship. They are not known vectors of human diseases, but they are annoying and can seriously affect morale. Bedbugs are approximately 1/5-inch long (5.1 mm), flat, reddish-brown insects with piercing and sucking mouth parts. They have nocturnal movement and feed only on blood. Their bite usually produces small, hard, white swellings (wheals). Habitual hiding places of bedbugs, such as the seams of mattresses, will often be obvious by the presence of dried black or brown excrement stains on surfaces where they congregate and rest. Their presence may also be indicated by blood stains on bedding.

For control of bedbugs, lightly apply the recommended insecticide to the sides and seams of all mattresses, which are best treated by folding and placing them in the center of the bunk at a 45° angle. Also treat other areas such as cracks and corners of bunks and empty lockers, springs, canvas bottoms and grommets, stanchions, and behind all equipment close to bulkheads. Bunks may be made up and occupied after 4 hours of ventilation following application. Complete control should be expected in 10 to 14 days.

COCKROACHES. Cockroaches are probably the most common and persistently troublesome arthropod pests encountered indoors. They are among the most adaptable insects known and may be found in structures noted for high sanitary standards. Cockroaches have never specifically been shown to be transmitters of disease; however, numerous pathogenic bacteria, viruses, and protozoa have been isolated from them and their feces. Because of their habits and close association with man they are well adapted for mechanical transmission of disease. Among the many different kinds of cockroaches that infest habitations are the German, American, and Australian cockroaches. They breed rapidly in the presence of food and warmth, shun the light, and are most active at night. During the day they tend to hide in cracks and other concealed places.

Cockroach infestations can be eliminated with high-level sanitary measures coupled with a thorough chemical control program.

Active food preparation areas cannot be kept clean enough to eliminate existing cockroach populations by starvation; however, the following should be kept in mind:

1. All food materials should be stored so as to be inaccessible to cockroaches.

2. Garbage and other refuse should be placed in containers with tight-fitting lids.

3. All food preparation areas, utensils, and equipment should be thoroughly cleaned after each day's use.

4. Food should be restricted from berthing areas.

5. Cleanliness reduces available food for cockroaches. As the level of sanitation increases, the level of infestation decreases.

6. Biweekly search and destroy programs should be conducted. (Spray cracks and crevices with aerosol insecticide; if cockroaches appear, spray with recommended insecticide.) Do not survey roaches on 1 day and treat identified sites another day.

Prevent entry of cockroaches by inspecting ship store items such as bagged potatoes and onions, bottle cases, and food packages prior to storage or use; also inspect contents of seabags. The elimination of harborages reduces insect populations, making the chemicals more effective.

Typical harborages include old and torn insulation; holes for plumbing and electrical lines as well as electrical switches and fuse boxes; areas between walls; areas behind drawers, oven hoods, under counters and serving lines; hollow areas in equipment and motor housings of refrigerators, mixers, milk machines, etc.

Effective chemical control goes hand-in-hand with sanitation. Check current instructions, especially BUMEDINST 6250.13 series, and your local preventive medicine unit for recommended chemicals and application procedures. Residual applications should be made to cracks, crevices, and other harborages where cockroaches have been found during surveys. Create barriers by applying a band of insecticide residue around all areas (excluding food preparation areas) that cockroaches must cross to reach food or to travel from place to place. Insecticide baits should be used in fuse boxes, electrical outlets, around stoves, ovens, heaters, refrigeration units, food vending machines, behind false bulkheads, and in enclosed motor areas. Baits are used in all locations where liquids may cause electrical shorting or fires. Aerosol space sprays can also be very effective if used properly.

MITES. Some mite species cause dermatitis in man and a few transmit scrub typhus, a severe and debilitating rickettsial disease endemic in some areas of the Far East.

Parasitic mites include the well known scabies or itch mite. The scabies mite is transmitted by close body contact and may appear wherever social conditions cause excessive crowding of people. This mite burrows into the horny layer of the dermis, causing intense itching, especially at night.

Personnel operating in endemic scrub typhus areas where chiggers (larvae) constitute a health hazard should be requied to use repellents and repellent-impregnated clothing. Locations that are to be used as camp sites should be prepared as fully as possible before the arrival of occupying units. All vegetation should be cut down or bulldozed to ground level and burned or hauled away. When troops must live or maneuver for periods of time in chigger-infested areas, it is recommended that area control with residual applications of insecticides be accomplished. The effectiveness of any residual insecticide will vary with both the species of chigger and the area involved. Consequently, for adequate results, experimentation with materials and application rates may be necessary. Contact the local preventive medicine unit for help or guidance.

Control measures for scabies or itch mites should be supervised by a medical officer. Control consists of treating infested individuals with a 1% gamma isomer of BHC (lindane) or other prescribed material and heat sterilization of clothing and bedding.

TICKS. Ticks are annoying pests because of their bite and their ability to cause tick paralysis. They also are important vectors of various infectious diseases, including tularemia, Q fever, endemic relapsing fever, Rocky Mountain spotted fever, tick-borne typhus, and Colorado tick fever.

There are four stages in the development of a tick: egg, larva, nymph, and adult. The eggs are laid on the ground, in cracks and crevices of houses, or in nests and burrows of animals. The larva, identifiable by the presence of six legs, is very small upon emergence from the egg. It requires at least one blood meal before it develops to the eight-legged nymphal stage. The nymph requires at least one blood meal and one or more molts of the exoskeleton before it undergoes metamorphosis to the adult stage.

The two principal types of ticks are hard and soft ticks. The hard ticks are identifiable by their distinct hard dorsal covering. They attach themselves to their hosts during feeding and may remain there for a long time before engorgement is completed. The soft ticks lack the distinct hard dorsal covering. They hide in cracks and crevices in houses or in the nests of their hosts and come out at night to feed on the blood of the host for a short period. The larvae and nymphs generally feed several times before molting. The adult female feeds a number of times, laying a small batch of eggs after each feeding.

Protection from ticks begins with avoidance of infested areas whenever possible and wearing of protective clothing. High-top shoes, boots, leggings or socks pulled up over the trouser cuffs help to prevent ticks from crawling onto the legs and body. At the end of the day, or more often, thoroughly inspect the body for attached ticks, making sure that none have migrated from infested to fresh clothing or bedding.

Personal application of the standard-issue insect repellent is effective against ticks. Apply the repellent by drawing the mouth of the inverted bottle along the inside and outside of clothing openings. Treatments with 2 fluid ounces (59.15 ml) of repellent per man per treatment have proved effective for 3 to 5 days. Impregnation of clothing with repellent is the method of choice for the protection of troops operating in tick-infested areas.

All ticks found on the body should be removed at once. The best method for removing attached ticks is to coat them with vaseline, baking powder paste, or clear nail polish. Care should be taken not to crush the tick or to break off the embedded mouthparts, which could be a source of infection. The wound should be treated with an antiseptic.

Clearing vegetation from infested areas will aid in the control of ticks and is recommended for bivouac and training grounds. All low vegetation should be uprooted with a bulldozer or cut and then burned or hauled away.

When troops must live or maneuver for periods of time in tick-infested zones, area control by residual application of sprays, dusts, or granules should be achieved.

If the brown dog tick has become established in dwellings, a residual emulsion spray is the treatment of choice. Apply the spray thoroughly to all possible harborages, including baseboards, around door and window moldings, behind pictures, under furniture, around the edges of rugs, on curtains and draperies, and in all cracks. A second and third treatment may be needed. Residual treatments in living spaces are to be made to infested areas only. Since this tick is usually introduced into living spaces by dogs, control procedures should also include thorough residual spraying of the spaces occupied by the dog at night and a weekly treatment of the dog as directed by a veterinarian.

FLEAS. Like most other blood-sucking parasites, fleas are intimately connected with the transmission of disease. They are material in the transmission of bubonic plague, which alone is sufficient to rank fleas among the most important insect enemies of man. They also transmit endemic or murine typhus and act as the intermediate host for certain parasitic worms.

Fleas are ectoparasites of birds and mammals. The nest or burrow of the host is the breeding place and contains the eggs, larva, pupa, and frequently the adult flea. The eggs are oval, pearly white, and dropped randomly on the ground, floor, or animal bedding where they hatch into larvae in a few days. Flea larvae are tiny, cylindrical, and maggotlike with neither legs nor eyes. They feed on organic matter and grow for about 2 weeks. When they are ready to pupate, the larvae spin silken cocoons that are somewhat viscid so that particles of dust, sand, and lint stick to them. Most fleas do not remain on their hosts continuously. Unlike most blood-sucking insects, fleas feed at frequent intervals, usually at least once a day.

Flea-infested areas should be avoided when possible. Protection can be afforded by wearing protective clothing or at least rolling the socks up over the trouser cuffs to prevent fleas from jumping onto the skin. The application of standard-issue insect repellents is effective for short periods.

Transmission of plague and endemic or murine typhus may be controlled by applying insecticidal dusts to rat runs and harborages. If rodent control measures are to be undertaken when flea-borne diseases are prevalent, dust rat burrows before beginning rodent control to prevent fleas from leaving dead or trapped rats and migrating to humans or animals.

In infested buildings a residual spray applied to the floor and on walls to a height of about 2 feet (.6096 m) above the floor has brought about a remarkable reduction in flea density.

Control of dog and cat fleas can be obtained through the use of a dust or a spray applied directly to the animal. Field applications, for the control of dog and cat fleas, may be made using an emulsion.

RODENTS. Rodents such as rats, mice, and ground squirrels are reservoirs for plague, endemic typhus, tularemia, and many other debilitating diseases. In addition, they can cause property damage and destruction. Rodents occur throughout the world; hence, their control is a problem in any geographic location.

Generally there are three species of common house rodents on the American mainland. Additional species occur in other areas of the world. The most important rodents from the medical and economic viewpoint are the Norway or brown rat, the black roof rat, and the house mouse.

Rodent control programs should include elimination of food and shelter, rodent-proofing of structures, and active destruction of rodents by poisoning and trapping.

Poisoning should be regarded as supplementary to environmental sanitation and trapping; it becomes the method of choice once rodents are under control. Proper sanitation, including garbage disposal, rat poisoning, harborage elimination, and food storage are of utmost importance in the permanent control of domestic rats and mice. Food storage structures should be completely rat-proofed. Supplies should be stockpiled on elevated platforms so that no concealed spaces exist. Garbage should be put in tightly covered cans that should be placed on concrete slabs or platforms. Surrounding areas should be carefully policed and garbage removed frequently. Open garbage dumps should not be tolerated.

When structures are built, all openings should be covered with 28-gauge, 3/8-inch (9.53 mm) mesh, galvanized hardware cloth; doors should be self-closing and tight-fitting, and those giving access to galleys and food-storage rooms should be equipped with metal flashing along the base. Walls and foundations should be of solid construction.

One of the most popular methods of killing rats is by the use of poisons. Resistance by rats and mice to the anticoagulants, particularly warfarin, is well documented in parts of Europe and the U.S., but where they are still effective they remain the method of choice. Rat poisons may be used alone or with water or food bait. The two most common species of rats have somewhat different food habits. Norway rats are more inclined to be meat and fish eaters; roof rats often prefer fruits and vegetables.

Anticoagulant rodenticides prevent blood clotting and cause capillary damage, leading in most cases to internal hemorrhage and death. At concentrations recommended for rodent control, anticoagulant agents are not detectable or objectionable to rodents, but for effective control they must be ingested several times. These feedings need not be on consecutive days but should occur within a 10- to 14-day interval. Adequate exposure to anticoagulant baits is contingent on the establishment of a sufficient number of protected bait situations. This can be accomplished by the use of properly constructed bait boxes. Baits can be protected by improvised means with locally available materials. Every container of poisoned bait must be labeled POISON with red paint in English and in the local language in a non-English speaking area. Bait stations should be inspected and replenished with fresh bait at weekly intervals.

Where rodent infestations occur, the use of both poisoned bait and traps is recommended to obtain quick initial control. When traps are no longer useful, they should be removed but the baiting continued. This is appropriate especially in buildings where food is stored, prepared, or served, unless it is determined that the building is not vulnerable to reinvasion. In tropical and semitropical areas where rodent infestation is commonplace and not confined to buildings, area as well as building control must be used.

Basically, the technique outlined for rat control is also used for mouse control. The main difference is that a large number of baits are placed in areas where mice are known to feed.

Premixed anticoagulant baits containing a rolled oat food base are obtainable from standard stock. If the food offered is not readily acceptable to the target rodent population, it may be necessary to test bait with additional food items. Cereal baits can be made more acceptable to rats by adding edible oil, peanut butter, and sugar. Test bait samples should be selected from three classes of foods known to be suitable bait. These include cereals (cornmeal, bread, mash, etc.) and fruits and vegetables (melons, bananas, sweet potatoes, etc.). It is important to use freshly prepared baits because rodents will reject stale or spoiled food.

Rat infestation in areas where water is scarce may often be controlled by using poisoned water. A water-soluble anticoagulant rodenticide is available from standard stock. Label instructions should be followed when using this item.

The following anticoagulant rodenticides are in use:

Common Name	Concentration in Baits	Concentration in Water
Diphacinone	0.005%	0.0013%
Fumarin	0.025%	0.0079%
Pival	0.025%	0.0079%
PMP	0.050%	0.0132%
Warfarin	0.025%	0.0079%

Rodenticide, Bait, Anticoagulant, FSN 6840-825-7023, is a ready-to-use type containing an anticoagulant chemical, rolled oats, a red dye, sugar, and mineral oil. This item is used directly from the container without further mixing.

The noncoagulant rodenticide zinc phosphide, although surpassed in safety and effectiveness by warfarin and other anticoagulants, can be used effectively by prebaiting if preferred anticoagulant rodenticides are unavailable. When rodents, especially rats, are well fed and not especially hungry, prebaiting 6 to 8 days gives better control than prebaiting for shorter periods. Warfarin and other anticoagulant rodenticides are self-prebaiting, thus eliminating the need to change from unpoisoned to poisoned bait. The optimum mix for zinc phosphide is 0.2 ounces (7.7 g) to 1 pound (.4536 kg) of bait.

It is frequently necessary and desirable to supplement poisoning with trapping. The wood-base spring trap is the most effective type and should be used in adequate numbers. Traps should be tied to overhead pipes, beams, or wires, nailed to rafters, or otherwise secured wherever black greasy marks indicate runways. On the ground rodents normally run close to walls; consequently, the traps should be set at right angles to the rodent runways, with trigger pans toward the bulkhead. Boxes and crates should be positioned to create passageways where rodents must travel over the traps. Although unbaited traps with the trigger pan enlarged with a piece of cardboard or lightweight metal may be used in narrow runways, trapping is usually more effective when accomplished with baited triggers. Preferred trap baits vary with the area and the species of rodents involved and include bacon rind, nuts, fresh coconut, peanut butter, raw vegetables, and bread or oatmeal dipped in bacon grease. Service all traps regularly to remove dead rodents and replace the bait.

Fumigation will effectively destroy rat populations in their burrows and other hiding places. This procedure is carried out only when burrows are away from buildings. Where fumigant can be confined, this method of control will also kill ectoparasites infesting the rats. Hydrocyanic acid gas applied as calcium cyanide dust is very effective for burrow fumigation. This dust should be applied by placing the hose nozzle of the foot-pumped duster into the burrow opening and pumping. A less effective method for small-scale fumigation is to throw 1 tablespoonful (14.7868 ml) of the dust into the burrow entrance. After the dust is applied, the burrow openings should be tamped shut with dirt or sand. Fumigation for rat control should be conducted only by the appropriately trained personnel.

Rat guards are used by naval vessels berthed in ports where plague is endemic to prevent rodents from entering the ship. After a ship leaves a plague-infected port, rat guards should be used at other foreign ports of call en route to the U.S. Rat guards are not required but are recommended for foreign ships in U.S. ports when the conveyance and cargo have been issued a quarantine preclearance in a retrograde cargo inspection program, even though the shipment may originate in a plague-endemic area.

Rodents are basically nocturnal. Therefore, gangways and landing ramps should be well lighted at night to discourage rodents from moving aboard. Gangways and other means of access to the vessel shall be separated from the shore by at least 6 feet unless guarded to prevent rodent movement. Cargo nets and similar devices extending between vessel and shore will be raised or removed when not in use.

Inspection of all subsistence items and cargo for sign of rodents, such as droppings, hair, gnawing, is essential in maintaining a rodent-free ship.

A current Certificate of Deratization or a Deratization Exemption Certificate is required for naval vessels. Requirements for this certificate are detailed in BUMEDINST 6250.7 series.

WATER SUPPLY ASHORE AND AFLOAT

A hygienically safe and continuously dependable water supply is one of the vital necessities of life. Water, like other natural resources, is procured as a raw material, manufactured into a commodity suitable for use, and distributed to places of consumption.

Drinking water must be free of disease-producing organisms, poisonous chemicals, and objectionable color, odor, or taste. All untreated water is considered unsafe until approved by a medical officer or his designated representative. Periodic laboratory examinations are required for all water supplies. See chapters 5 and 6 of the Manual of Naval Preventive Medicine for more detailed information on this subject.

WATER SOURCES

A satisfactory water source is one with a natural supply of water large enough to supply all needs of using troops and of such quality that it can be readily purified by available equipment. Sources are classified as follows:

1. Rainwater: catchment.
2. Ground water: wells and springs.
3. Surface water: streams, ponds, lakes and rivers.
4. Sea water: distillation.
5. Dew: condensation on cool surfaces.
6. Vegetation: coconut, wild pineapple, and cactus.
7. Snow and ice: heat.

WATER SUPPLY ASHORE

With rare exceptions, naval activities ashore within the continental limits of the U.S. are situated where a municipal water supply is available. The municipality is responsible for the delivery of water that is pure and safe from contamination. The city is not obligated, however, to deliver water containing a residual disinfectant; the Navy must make arrangements to ensure this condition, if necessary. The Navy is responsible for the protection of the purity of the water during distribution through the system on its premises.

Most municipal systems in the U.S. supply water that meets the quality standards of the Environmental Protection Agency, and is generally of pleasing nature. All water secured from water systems abroad must be considered unsafe until tested and, if necessary, disinfected.

Field Disinfection of Water

A hospital corpsman attached to a Marine unit or a naval construction battalion (Seabees) may frequently be called upon to approve field water sources and to recommend disinfection methods before water is considered safe to drink. In a field situation all water should be considered unsafe until it has been tested and, if necessary, disinfected. Approval of water sources should be based on a thorough surveillance of the situation, including the color, odor, and turbidity of the water; the presence of vegetation or dead animals at the water point; possible sources of pollution upstream. The hospital corpsman should seek out the best available water for the unit.

When safe water is not available, each individual must produce his or her own potable water by using a canteen and iodine purification tablets or ampules of calcium hypochlorite. Check iodine tablets for physical change prior to use, as they lose their effectiveness in time. Tablets should be intact, not stuck together, and steel gray. The following procedure is used for treating canteen water with iodine tablets:

1. Fill the canteen with the clearest, cleanest water available.
2. Add 1 iodine tablet to a 1-quart canteen of water (add 2 tablets if the water is cloudy). An additional tablet should be added for each additional quart of water.
3. Replace the canteen cap loosely, wait 5 minutes, then agitate the canteen so that the threads around the neck of the canteen are rinsed.
4. Tighten the cap and wait an additional 20 minutes before using the water.

The following procedure is used for disinfecting canteen water with calcium hypochlorite ampules:

1. Fill the canteen with the clearest, cleanest water available, leaving an air space of at least 1 inch below the neck of the canteen.
2. Add 1 ampule of calcium hypochlorite to a canteen cup half full of water; stir with a clean stick until the powder is dissolved.
3. Fill the canteen cap half full of the solution in the cup and add it to the water in the canteen; place the cap on the canteen and thoroughly agitate. (If you are using a 1-quart aluminum canteen, add a minimum of 3 capfuls of disinfectant solution to the canteen, as this cap is much smaller than the one on plastic canteens.)
4. Loosen the cap slightly; invert the canteen to allow the treated water to leak onto the threads around the canteen neck.
5. Tighten the cap and wait at least 30 minutes before using the water.

Boiling the water, a method used when disinfecting chemicals are not available, will kill disease-producing organisms. Water must be held at an active boil for at least 15 to 20 minutes to make it safe for consumption.

WATER SUPPLY AFLOAT

Potable water for shipboard use comes either from the sea via the ship's evaporators, from another ship, or from sources ashore. The ship's medical department is responsible for determining the quality of the water; the engineering section determines the quantity stored or produced and does the actual chlorination or bromination.

Free available chlorine (FAC)

Potable water obtained from an area where amebiasis or hepatitis is endemic must be chlorinated or brominated to obtain a 2.0 ppm residual in the tanks following a 30 minute contact period.

Water obtained from an approved source or distilled in open seas must be chlorinated to 0.2 ppm following a 30 minute contact period.

The free available chlorine level of a ship's water supply is checked by the Palin-DPD method. With this method a tablet is placed in a small test tube filled with water. If chlorine (or bromine for ships having bromine disinfection) is present in the water, a color change will take place as the tablet dissolves. When the tablet is fully dissolved, the color of the sample is compared to color standards furnished with the kit. When a color match is obtained, the disinfectant residual is read directly from amounts printed on the kit next to the color standards.

Calcium Hypochlorite

Calcium hypochlorite 70% (HTH) in 6-ounce plastic bottles is the only form of chlorine that may be carried aboard ships.

Extreme caution must be observed in storing and handling calcium hypochlorite. Although this chemical itself is not combustible, it is a strong oxidizing agent and will react readily with organic materials such as paint, oil, solvents, and even wet garbage. In contact with these materials, calcium hypochlorite will produce large amounts of heat or fire and chlorine gas. Specific handling and storage precautions are contained in the NAVSHIPS Technical Manual, chapter 670.

Bacteriological Testing

In addition to being responsible for FAC determinations, the Medical Department representative is required to test the water at least weekly for bacterial content.

Bacteriologic examinations should be carried out on samples collected from the tanks and at representative points throughout the ship's distribution system. The number of samples should be based on the size of the distribution system, but no less than four samples should be tested each week. Daily samples are collected following unsatisfactory results and are to be considered in addition to the routine weekly samples for record purposes. The steps for obtaining water samples are as follows:

1. Flame spigot. Cotton moistened with alcohol and held with thumb forceps makes a satisfactory alcohol lamp.
2. Take chlorine reading with colorimeter. Log on DD-686 to accompany water sample.
3. Let water run for 1 full minute (at least 5 minutes for shore installations).
4. Collect sample. Take care not to contaminate cap or top of bottle.
5. Replace cap. Sample is marked for identification and refrigerated during transportation to the laboratory.

NOTE: DO NOT TAKE SAMPLES FROM LEAKING SPIGOTS.

There are currently two acceptable methods for testing the bacterial content of water. One is the multiple-tube fermentation procedure, which requires much laboratory preparation, physical space, and time. The other method is the membrane filter technique, which is the method of choice for bacteriological testing aboard ship. The membrane filter method utilizes the concept of filtering the water sample to trap any bacteria present in the water onto a thin membrane. The membrane is placed in a small plate containing a broth media, and the plate is then incubated for 24 hours at 35°C to see if bacterial colonies appear. Each bacterial colony that appears represents one bacteria cell present in the water sample.

If bacteriological testing reveals colonies with a greenish-gold metallic sheen (coliform bacteria), fecal contamination of the water is indicated and the Medical Department representative must immediately institute corrective action in accordance with the Manual of Naval Preventive Medicine, chapter 6. If growth occurs but none of the colonies have the characteristic coloring, then the chlorine residual should be evaluated and increased to an acceptable level. If no bacterial growth is noted, no action is required.

ICE

Ice intended for use in food or drink must be manufactured from potable water only and must be afforded the same sanitary considerations as other foods. Ice-making machines should be cleaned and inspected periodically by maintenance personnel to ensure proper operation. The Medical Department representative should be familiar with the operation of ice machines so that design and installation discrepancies that could lead to ice contamination will be recognized. For example, ice machine drain pipes should not be connected directly to a ship's drain line; there should be a space (air gap) between the machine drain pipe and the ship's receiving drain.

The Medical Department representative should include ice samples in weekly bacteriological analyses. This is accomplished by collecting ice in sterile containers, allowing the ice to melt, and then submitting the sample for membrane filter analysis for coliform bacteria.

442

CHAPTER 12

CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL WARFARE

INTRODUCTION

The use of chemical agents in warfare, frequently referred to as "gas warfare," may be defined as the deliberate use of a variety of chemical agents in gaseous, solid, or liquid states for the express purpose of harassing personnel or producing casualties, rendering areas impassable or untenable, contaminating food and water, or initiating incendiary action.

The first large-scale use of chemical agents and weapons came in the First World War when, in 1915, the Germans released chlorine gas against the Allied positions at Ypres, Belgium. Over 5,000 casualties resulted. There were other gas attacks by both combatant forces during World War I, and it is well documented that approximately one-third of all American casualties in this conflict were due to chemical agents.

During the interval between WWI and WWII, each of the major powers continued to develop its capability for chemical warfare in spite of the Geneva Treaty banning it. In isolated cases in the late '30s, toxic chemical agents were used; however, they were not used during the Second World War.

Toxic chemicals were not authorized for use in Korea or Vietnam. Defoliants and riot control agents were used with some degree of effectiveness in the jungles of Vietnam in tunnel and perimeter clearing operations.

A naval unit afloat finds itself in a unique situation concerning defense against toxic chemical agents. Because agents can be released as liquids or clouds of vapor or aerosol, they can envelop the exterior of a vessel and penetrate within the hull due to extensive use of artificial ventilation aboard ship. Therefore, extensive contamination may result from such an attack. Since the ship, in most instances, cannot be abandoned, it must be decontaminated while the personnel continue manning it.

The medical officer or the hospital corpsman on independent duty must organize his or her department to meet the medical needs of defense against chemical agents well in advance of actual need. All hands must be indoctrinated in the use of protective equipment and self-aid procedures. Close liaison and planning must be maintained with damage control personnel responsible for decontamination, and all medical personnel must know the approved methods for treating chemical agent casualties.

Biological agents have never been used as part of a weapons systems. There is some doubt about their tactical effectiveness. However, as a strategic device, as a covert weapon, biological agents are ideally suited. Throughout the history of warfare, disease has been as effective as combat in causing casualties. Recall the plagues that swept Europe during the Middle Ages or, more recently, the influenza outbreaks of 1918, 1958, and 1968. Any epidemic can totally disrupt normal functioning. Imagine being able to cause an epidemic when and where you choose and you have some idea of the potential military strategic usefulness of biological warfare. The importance of planning and training for defense against chemical and biological agents cannot be underestimated.

CHEMICAL AND BIOLOGICAL WEAPONS

Chemical and biological (CB) weapons have unique characteristics that distinguish them from conventional or nuclear weapons.

- CB weapons do not destroy material; they are antipersonnel in the truest sense. They are effective against buildings, fortifications, ships, and aircraft. They penetrate without physical damage to the target to produce casualties.

- CB weapons are particularly adaptable for use against large groups of people. Densely populated areas having transportation or manufacturing facilities that must be preserved for economic or political reasons would be ideal targets. Large numbers of casualties can be produced with minimal damage to property.

There are differences between chemical and biological weapons which determine their usefulness in a particular situation. In general, chemical weapons are more suited for tactical use while biological weapons have a strategic role. Several factors contribute to this.

- Chemical agents produce their effects within seconds to hours; the effects of exposure to biological agents do not occur for several hours to days.

- Human susceptibility to chemical agents is universal; immunity to disease from biological agents varies widely.

- There is, as yet, no effective method of immunization against chemical agents, but a variety of vaccines is available for many biological agents.

- There are specific antidotes for chemical agents which are effective, but for many biological agents no specific treatment exists and some are specifically tailored to be drug-resistant.

Your responsibility for CB warfare is to be aware of the effects of its agents so that you can continue to maintain the health and welfare of those for whom you are responsible. This chapter is an introduction to that end. More complete information on CBR can be obtained from Navy and DOD publications available at all Navy commands and medical departments.

CHEMICAL AGENTS

In any discussion of toxic chemical agents it is convenient to consider them under several classifications. The broadest classification we will use is based on the general effect produced (i.e., severe casualty, incapacitation, or harassment). Within each general group there are further breakdowns. The most convenient, from a medical point of view, is the classification by physiological effect.

Casualty-producing chemical agents include:

- Nerve agents, which produce their effect by interfering with transmission of nerve impulses in the parasympathetic autonomic nervous system.

- Blister agents or vesicants, which cause severe blistering of exposed skin.

- Blood agents, which interfere with oxygen transfer.

- Choking agents, which irritate the bronchi and cause pulmonary edema.

Under incapacitants, the psychochemicals are the main group. They produce mental confusion and inability to function intelligently.

Harassing agents are also called riot control agents and include:

- Tear gas, which causes severe tearing and eye pain, but for a very short duration.
- Vomiting agents, which induce vomiting, but which also are of very short duration.

Chemical agents may also be classified as lethal or nonlethal for obvious reasons. They may further be classified as persistent or nonpersistent, depending on the length of time they retain their effectiveness after dissemination.

NERVE AGENTS

Physically, nerve agents are odorless, almost colorless liquids varying greatly in viscosity and volatility. They are moderately soluble in water and fairly stable unless strong alkali or chlorinating compounds are added. They are very effective solvents readily penetrating cloth either as a liquid or vapor. Other materials, including leather and wood, are fairly well penetrated. Butyl rubber and synthetics, such as polyesters, are much more resistant.

Pharmacologically, the nerve agents are cholinesterase inhibitors. Their reaction with cholinesterases is not reversible and consequently the effects of inhibition are prolonged until the body synthesizes new cholinesterase.

Signs and Symptoms of Exposure. Nerve agent intoxication can be readily identified by its characteristic signs and symptoms. If a vapor exposure has occurred, the pupils will constrict, usually to a pinpoint; if the exposure has been through the skin, characteristic local twitching will occur.

Other symptoms will include runny nose, dyspnea, diarrhea and vomiting, convulsions, massive salivation, drowsiness, coma, and unconsciousness.

Treatment. Specific therapy for nerve agent casualties is atropine, an acetylcholine blocker.

For immediate self and/or first aid, each individual is issued three automatic injectors containing 2 mg of atropine sulfate for intramuscular injection, or 2 autoinjectors containing Nerve Agent Antidote.

These injectors are designed to be used by individuals on themselves when symptoms appear. After the first injection, if the symptoms have not disappeared within 10-15 minutes, another injection should be given. If symptoms still persist after an additional 15 minutes, a third injection may be given by nonmedical personnel.

For medical personnel, the required therapy is to continue to administer atropine at 15-minute intervals until a mild atropinization occurs. This can be noted by tachycardia and dry mouth. Atropine alone will not relieve any respiratory muscle failure. Prolonged artificial respiration may be necessary to sustain life.

Oxime therapy, using praldoxime chloride, or 2-PAM Cl, may also be used for regeneration of the blocked cholinesterase. For individuals treated initially with the new autoinjector, additional oxime is generally not medically indicated as it is already included in the autoinjector.

VESICANTS

Blister agents or vesicants exert their primary action on the skin, producing large and painful blisters that are incapacitating. Although vesicants are classed as nonlethal, high doses can cause death.

Common blister agents include mustard (HD), nitrogen mustard (HN), and lewisite (L). Although each is chemically different and will cause significant specific symptoms, they are all sufficiently similar in their physical characteristics and toxicology to be considered as a group. Mustards are particularly insidious because they do not manifest their symptoms for several hours after exposure. They attack the eyes and respiratory tract as well as the skin. Further, there is no effective therapy for mustard once its effects become visible. Treatment is largely supportive, to relieve itching and pain and to prevent infection.

Mustard (HD) and Nitrogen Mustard (HN) are oily, colorless or pale yellow liquids, sparingly soluble in water. HN is less volatile and more persistent than HD and has the same blistering qualities.

Symptoms of HD and HN. The part of the body most vulnerable to mustard gas is the eyes. Contamination insufficient to cause injury elsewhere may produce eye inflammation. Vapor or liquid may burn any area of the skin, but the burns will be most severe in the warm, sweaty areas of the body—the armpits, groin, face, and neck. Blistering begins in about 12 hours, but may be delayed for up to 48 hours. Inhalation of the gas is followed in a few hours by irritation of the throat, hoarseness, and cough. Fever, moist rales, and dyspnea may develop. Bronchopneumonia is a frequent complication; the primary cause of death is massive edema or mechanical pulmonary obstruction.

Because the eye is the most sensitive part of the body, the first noticeable symptoms of mustard exposure will be pain and a gritty feeling in the eye, accompanied by spastic blinking of the eyelids and photophobia.

Treatment of HD and HN. There is no specific antidotal treatment for mustard poisoning. Physically removing as much of the mustard as possible, as soon as possible, is the only effective method for mitigating symptoms before they appear. All other treatment is symptomatic—to relieve pain and itching, and to control infection.

Lewisite (L) is an arsenical. This blistering compound is a light to dark brown liquid that vaporizes slowly.

Symptoms of L. The vapors of arsenicals are so irritating that conscious persons are immediately warned by discomfort to put on the mask. No severe respiratory injuries are likely to occur, except in the wounded who are incapable of donning a mask. The respiratory symptoms are similar to those produced by mustard gas. While distilled mustard and nitrogen mustard cause no pain in the eye during absorption, lewisite causes intense pain upon contact.

Treatment of L. Immediately decontaminate the eyes by flushing with copious amounts of water to remove liquid agents and to prevent severe burns. Sodium sulfacetamide, 30% solution, may be used to combat eye infection after the first 24 hours. In severe cases, morphine may be given to relieve pain. As with mustards, all other treatment is symptomatic.

British Anti-Lewisite (BAL), dimercaprol, is available in a peanut oil suspension for injection in case of systemic involvement. BAL is a specific antiarsenical, which combines with heavy metals to form a water-soluble, non-toxic complex that is excreted. However, BAL is somewhat toxic and an injection of more than 3 mg/kg will cause severe symptoms.

Aside from the use of dimercaprol for systemic effects of arsenic, treatment is the same as for mustard lesions.

BLOOD AGENTS

Hydrocyanic acid (AC) and cyanogen chloride (CK) are cyanide-containing compounds commonly referred to as blood agents. These blood agents are chemicals that are in a gaseous state at normal temperatures and pressures. They are systemic poisons and casualty-producing agents that interfere with vital enzyme systems of the body. They can cause death in a very short time after exposure by interfering with oxygen transfer in the blood. Although very deadly, they are nonpersistent agents.

Symptoms. These vary with concentration and duration of exposure. Typically, either death or recovery takes place rapidly. After exposure to high concentrations of the gas, there is a forceful increase in the depth of respiration for a few seconds, violent convulsions after 20 to 30 seconds, and respiratory failure and cessation of heart action within a few minutes.

Treatment. There are two suggested antidotes in the treatment of cyanides. Amyl nitrite in crush ampules is provided as first aid. Follow-up therapy with intravenous sodium thiosulfate solution is required.

In an attack, if you notice sudden stimulation of breathing or an almondlike odor, hold your breath and don your mask immediately. If no blood agent is present in the atmosphere, crush two ampules of amyl nitrite in the hollow of your hand and hold it close to the patient's nose. This may be repeated every few minutes until 8 ampules have been used. If the atmosphere is contaminated and the patient must remain masked, insert the crushed ampules into the mask under the face plate.

Whether nitrite is used or not, sodium thiosulfate therapy is required after the initial lifesaving measures. The required dose is 100-200 mg/kg given intravenously over a 10-minute period.

The key to successful cyanide therapy is speed; cyanide acts rapidly on an essential enzyme system. The antidotes act rapidly to reverse this action. If the specific antidote and artificial respiration is given soon enough, the chance of survival is greatly enhanced.

CHOKING OR LUNG AGENTS

The toxicity of lung agents is due to their effect on lung tissue; they cause extensive destruction of alveolar tissue, resulting in severe pulmonary edema. This group includes phosgene (CG) and chlorine (CL) as well as chloropicrin and diphosgene. However, CG is most likely to be encountered and its toxic action is representative of the group.

It is a colorless gas with a distinctive odor similar to that of new-mown hay; unfortunately the minimal concentration in air that can cause damage to the eyes and throat is below the threshold of olfactory perception. Generally speaking, CG does not represent a hazard of long duration, so that if an individual were to be exposed to a casualty producing amount, he or she should be able to smell it.

Symptoms. There may be watering of the eyes, coughing, and a feeling of tightness in the chest. More often, however, there will be no symptoms for 2 to 6 hours after exposure. Later symptoms are rapid, shallow, and labored breathing; painful cough; cyanosis; frothy sputum; leadened, clammy skin; rapid, feeble pulse; and low blood pressure. Shock may develop, followed by death.

Treatment. Once symptoms appear, complete bed rest is mandatory. Keep patients with lung edema only moderately warm, and treat the resulting anoxia with oxygen. Because no specific treatment for CG poisoning is known, treatment has to be symptomatic.

PSYCHOCHEMICAL AGENTS

Psychochemical agents, often referred to as incapacitating agents, prevent an individual from temporarily carrying out assigned actions. These agents may be administered covertly by contaminating food or water, or they may be released as aerosols. Some of the characteristics of the incapacitants are as follows. They

- are highly potent (i.e., an extremely low dose is effective) and logistically feasible;
- produce their effects mainly by altering or disrupting the higher regulatory activity of the central nervous system;
- have a duration of action of hours or days, rather than a momentary or transient action;
- produce no permanent injury

Symptoms. The first symptoms appear in 30 minutes to several hours and may persist for several days. Abnormal, inappropriate behavior may be the only sign of intoxication. Those affected may make irrational statements and have delusions or hallucinations. In some instances the patient may complain of dizziness, muscular incoordination, dry mouth, and difficulty in swallowing.

The standard US incapacitant is BZ, a cholinergic blocking agent, which is effective in producing delirium that may last several days. In small doses it will cause an increase in heart rate, pupil size and skin temperature, as well as drowsiness, dry skin, and a decrease in alertness. As the dose is increased to higher levels, there is a progressive deterioration of mental capability, ending in stupor.

Treatment. The principal requirement for first aid is to prevent victims from injuring themselves and others during the toxic psychosis. Generally, there is no specific therapy for intoxication. However, with BZ and other agents in the class of compounds known as glycolates, physostigmine is the treatment of choice. It is not effective during the first 4 hours following exposure; after that, it is very effective as long as treatment is continued. However, treatment does not shorten the duration of BZ intoxication, and premature discontinuation of therapy will result in relapse.

RIOT CONTROL AGENTS

"Riot control agents" is the collective term used to describe a divergent collection of chemical compounds, all having similar characteristics. They are relatively nontoxic compounds, which, in very low concentration, produce an immediate but temporary effect. Generally, no therapy is required; removal from their environment is sufficient for recovery in a short time.

These agents are either lacrimators or sternutators (that is, tearing or vomiting agents).

LACRIMATORS

Lacrimators or tear gases are essentially local irritants that act primarily on the eyes. In high concentrations they irritate the respiratory tract and the skin. These agents are used to harass enemy personnel or to discourage riot action. The principal agents used are chloracetophenone (CN) and orthochlorobenzilidine malanonitrile (CS). Although CS is basically a lacrimator, it is considerably more potent than CN and causes more severe respiratory symptoms. CN is the standard training agent and is the tear gas most commonly encountered. CS is more widely used by the military as a riot control agent.

Protection against all tear agents is provided by protective masks and (for CS) ordinary field clothing secured at the neck, wrist, and ankles. Personnel handling CS should wear rubber gloves for additional protection.

Symptoms. Lacrimators produce intense pain in the eyes with excessive tearing. Symptoms following the most severe exposure to vapors seldom last over 2 hours; after moderate exposure they last only a few minutes.

Treatment. First aid for lacrimators generally is not necessary. Exposure to fresh air and letting wind blow into wide open eyes, held open if necessary, is sufficient for recovery in a short time. Any chest discomfort after CS exposure can be relieved by talking.

An important point to remember is that this material adheres to clothing tenaciously and a change of clothing may be necessary. Don't forget the hair, both head and facial, as a potential source of recontamination.

STERNUTATORS

The second class of agents in the riot control category are the sternutators, or vomiting agents. All of them have similar properties and pathology.

Symptoms. Sternutators produce strong pepperlike irritation in the upper respiratory tract with irritation of the eyes and lacrimation. They cause violent uncontrollable sneezing, coughing, nausea, vomiting, and a general feeling of malaise. The principal agents of this group are diphenylaminochloroarsine (adamsite, DM), diphenylchlorarsine (DA) and diphenylcyanarsine (DC). They are used as training and riot control agents. They are dispersed as aerosols and produce their effects by inhalation or by direct action on the eyes.

Inhalation causes a burning sensation in the nose and throat, hypersalivation, and rhinorrhea. The sinuses fill rapidly and cause a violent frontal headache.

Treatment. It is of the utmost importance that the mask be worn in spite of coughing, sneezing, salivation, and nausea. If the mask is put on following exposure, symptoms will increase for several minutes in spite of adequate protection. As a consequence, victims may believe the mask is ineffective and remove it, further exposing themselves. While the mask must be worn, it may be lifted from the face briefly, if necessary, to permit vomiting or to drain saliva from the face piece. Carry on duties as vigorously as possible. This will help to lessen and shorten the symptoms. Combat duties usually can be performed in spite of the effects of sternutators if an individual is motivated.

First aid consists of washing the skin and rinsing the eyes and mouth with water. A mild analgesic may be given to relieve headache. Usually there is spontaneous recovery which is complete within 1 to 3 hours.

SCREENING SMOKES

A few words about screening smokes are in order since they fit in with, and complement, riot control agents. Their primary use is to obscure vision, or to hide targets or areas. When used for this purpose outdoors, they are not generally considered toxic. However, exposure to heavy smoke concentration for extended periods, particularly near the source, may cause illnesses or death. Under no circumstances should smoke munitions be activated indoors or in closed compartments.

Symptomatic treatment of medical problems or discomfort resulting from exposure to screening smokes will generally suffice.

WHITE PHOSPHORUS

White phosphorus (WP) smoke not only obscures, but also has a secondary effect upon personnel if burning WP contacts the skin.

WP is a pale waxy solid that ignites spontaneously on contact with air to give a hot, dense, white smoke composed of phosphorus pentoxide particles. While field concentrations of the smoke may cause temporary irritation to the eyes, nose, and throat, casualties from the smoke have not occurred in combat operations. No treatment is necessary and spontaneous recovery is rapid.

If burning particles of WP embed in the skin, they must be covered with water, a wet cloth, or mud. A 0.5% solution of copper sulphate, which produces an airproof black coating of copper phosphide, may be applied. The phosphorus particles must be removed surgically.

RADIOLOGICAL WARFARE

The effects of radiation must be understood to apply this knowledge intelligently to the sorting of casualties. The special procedures for nuclear first aid are important, and you must become familiar with them to function effectively as a hospital corpsman.

ACTION BEFORE NUCLEAR EXPLOSION

If there is sufficient warning in advance of an attack, head as quickly as possible for the best shelter available. If you are on duty, your action must be determined by the circumstances existing at the time. In general, this will be the same as for an attack by ordinary high explosive bombs. At the sound of the alarm, get your protective mask ready. Proceed to your station or to a shelter as ordered. If you are ordered to a shelter, remain there until the "all clear" signal is given.

In the absence of specially constructed shelters during a nuclear explosion ashore, you can get some protection in a foxhole, a dugout, or the lowest floor or basement of a reinforced concrete or steel framed building. Generally, the safest place is in the basement near walls. The next best place is on the lowest floor in an interior room, passageway, or hall, away from the windows and, if possible, near a supporting column. Avoid wooden buildings if at all possible. If you have no choice, take shelter under a table or bed rather than go out into the open. If you have time, draw the shades and blinds to keep out most of the heat from the blast. Only those people in the direct line of sight of thermal emission will be burn casualties; that is, anything that casts a shadow will afford protection.

Tunnels, storm drains, and subways provide effective shelter except in the case of a nearby underground explosion. In the event of a surprise attack, no matter where you are, out in the open on the deck of a ship, in a ship compartment, out in the open ashore, or inside a building, drop to a prone position in a doorway or against a bulkhead or wall. If you have a protective mask with you, put it on. Otherwise, hold or tie a handkerchief over your mouth and nose. Cover yourself with anything at hand, being especially sure to cover the exposed portions of the skin, such as the face, neck, and hands. If this can be done within a second of seeing the bright light of a nuclear explosion, some of the heat radiation may be avoided. Ducking under a table, desk, or bench indoors, or into a trench, ditch, or vehicle outdoors, with the face away from the light, will provide added protection.

EFFECTS ON PERSONNEL

The injuries to personnel resulting from a nuclear explosion may be divided into three broad classes:

1. Blast and shock injuries
2. Burns
3. Ionizing radiation effects

Apart from the ionizing radiation effects, most of the injuries suffered in a nuclear weapon explosion will not differ greatly from those caused by ordinary high explosives and incendiary bombs. An important aspect of injuries in nuclear explosions is the "combined effect," that is, a combination of all three types of injuries. For example, a person within the effective range of a weapon may suffer blast injury, from burns, and also from the effects of nuclear radiation. In this respect, radiation injury may be a complicating factor, since it is combined with injuries due to other sources.

449

Blast and Shock Wave Injuries

Injuries caused by blast can be divided into:

1. Primary (direct) blast injuries
2. Secondary (indirect) blast or mechanical injuries

Primary blast injuries are those that result from the direct action of the air shock wave on the human body. These injuries will be confined to a zone where fatal secondary blast and thermal damage may be anticipated. Therefore, most injured personnel will not have the severe injuries that result from the direct compressive effects of the blast wave.

Secondary blast injuries are caused by collapsing buildings and by timber and other debris flung about by the blast. Persons may also be hurled against stationary objects or thrown to the ground by the high winds accompanying the explosions. The injuries sustained are thus similar to those due to a mechanical accident: bruises, concussions, cuts, fractures, and internal injuries.

At sea the shock wave accompanying an underwater burst will produce various "mechanical" injuries. These injuries will resemble those caused aboard ship by more conventional underwater weapons, such as noncontact mines and depth charges, but instead of being localized, they will extend over the entire vessel.

Equipment, furniture, gas cylinders, boxes, and similar gear, when not well secured, can act as missiles and cause many injuries.

Burn Injuries

A weapon detonated as an air burst may produce more burn casualties than blast or ionizing radiation casualties. Burns due to a nuclear explosion can also be divided into two classes; direct and indirect burns. Direct burns (usually called flash burns) are the result of thermal (infared) radiation emanating from a nuclear explosion, while indirect burns result from fires caused by the explosion. Biologically, they are similar to any other burn and are treated in the same manner.

Since all radiation travels in a straight line from its source, flash burns are sharply limited to those areas of the skin facing the center of the explosion. Furthermore, clothing will protect the skin to some degree unless the individual is so close to the center of the explosion that the cloth is ignited spontaneously by heat. Although light colors will absorb heat to a lesser degree than dark colors, the thickness, air layers, and types of clothing (wool is better than cotton) are far more important for protection than the color of the material.

Eye Burns

In addition to injuries to the skin, the eyes may also be affected by thermal radiation. If people are looking in the general direction of a nuclear detonation, they may be flash blinded. This blindness may persist for 20 to 30 minutes.

A second and very serious type of eye injury may also occur. If people are looking directly at the fireball of a nuclear detonation, they may receive a retinal flash burn similar to the burn that occurs on exposed skin. Unfortunately, when the burn heals, the destroyed retinal tissue is replaced by scar tissue that has no light perception capability, and the victims will have scotomas, blind or partially blind areas in the visual field. In severe cases, the net result may be permanent blindness. The effective range for eye injuries from the flash may extend for many miles when a weapon is detonated as an air burst. This effective range is far greater at night when the pupils are dilated, thereby permitting a greater amount of light to enter the eye.

Radiation Injuries

Radioactivity may be defined as the spontaneous and instantaneous decomposition of the nucleus of an unstable atom with the accompanying emission of a particle, a gamma ray, or both. The actual particles and rays involved in the production of radiation injuries are the alpha and beta particles, the neutron, and the gamma ray. These particles and rays produce their effect by ionizing the chemical compounds that make up the living cell. If enough of these particles or rays disrupt a sufficient number of molecules within the cell, the cell will not be able to carry on its normal functions and will die.

Alpha particles are emitted from the nucleus of some radioactive elements. Alpha particles are helium nuclei of nuclear origin having an atomic mass number of four and an electrical charge of two positive. Because of this charge, alpha particles produce a high degree of ionization when passing through air or tissue. Also, due to their large size and electrical charge, they are rapidly stopped or absorbed by a few inches of air, a sheet of paper, or the superficial layers of skin. Thus, alpha particles do not constitute a major external radiation hazard. However, because of their great ionization power, they constitute a serious hazard when taken into the body through ingestion, inhalation, or an open wound.

Beta particles are electrons of nuclear origin. They have a mass of approximately 1/2,000 of a hydrogen atom and an electrical charge of minus one. The penetration ability of a beta particle is greater than an alpha particle, but will only penetrate a few millimeters of tissue and will most probably be shielded out by clothing. Therefore, beta particles, like alpha particles, do not constitute a serious external hazard; however, like alpha particles, they do constitute a serious internal hazard.

Neutrons are particles with no electrical charge and a mass of approximately one, which are emitted from the nucleus of the atom. Their travel is therefore unaffected by the electromagnetic fields of other atoms. The neutron is a penetrating radiation which interacts in billiard ball fashion with the nucleus of small atoms like hydrogen. This interaction produces high energy, heavy ionizing particles which can cause significant biological damage similar to alpha particles.

Gamma rays are electromagnetic waves having no mass or electrical charge. Biologically, gamma rays are identical to X-rays of the same energy and frequency. Because they possess no mass or electrical charge, they are the most penetrating form of radiation. Gamma rays produce their effects mainly by knocking orbital electrons out of their path, thereby ionizing the atom so affected, and imparting energy to the ejected electron. Neutrons and gamma rays are emitted at the time of the nuclear explosion along with light. Gamma rays and beta radiation are present in nuclear fallout along with alpha particles from unfissioned nuclear material. Neutrons and gamma rays are an important medical consideration in a nuclear explosion since their range is great enough to produce biologic damage either alone or in conjunction with blast and thermal injuries.

TREATMENT OF NUCLEAR CASUALTIES

Most injuries resulting from the detonation of a nuclear device are likely to be mechanical wounds resulting from collapsing buildings and flying debris and burns caused by heat and light liberated at the time of detonation.

A burn is a burn regardless of whether it is caused by an A-bomb or napalm, and its management remains the same. This is also true of fractures, lacerations, mechanical injuries, and shock. In none of these is the treatment dictated by the cause. For most of the conventional injuries, standard first-aid procedures should be followed.

The following word of caution should be considered when you are treating wounds and burns. Dressings for wounds and burns should follow a closed-dressing principle, with application of an adequate sterile dressing using aseptic techniques, if sufficient medical supplies are available. Make no attempt to close the wound, regardless of its size, unless authorized by a physician. A few variations in treatment have been proposed by researchers in the field, one concerning the use of antibiotics. If signs of infection and fever develop, give antibiotics. When a physician is not available to direct treatment, the corpsman should select an antibiotic on the basis of availability and appropriateness and administer three times the recommended amount. If the antibiotic does not control the fever, switch to another. If the fever recurs, switch to still another. Overwhelming infection can develop rapidly in the pancytopenic state from burn or hematopoietic damage from radiation.

Whenever a broad-spectrum antibiotic is given, oral antifungal antibiotics should be administered.

To date, there is no specific therapy for injuries produced by lethal or sublethal doses of ionizing radiation. This does not mean that all treatment is futile. Good nursing care and aseptic control of all procedures is a must; casualties should get plenty of rest, light sedation if they are restless or anxious, and a bland, nonresidue diet.

DECONTAMINATION

Each member of the armed forces is responsible for carrying out personal decontamination measures at the earliest opportunity. Medical personnel will direct decontamination of casualties who are physically unable to perform this function.

Decontamination of the ship as a whole is the responsibility of the damage control officer.

The principle in personnel decontamination is to avoid the spread of contamination to clean areas and to manage casualties without aggravating other injuries.

It will frequently be necessary to decide whether to handle the surgical condition or the CBR hazard first. If the situation and the condition of the casualty permit, decontamination should be carried out first. The longer the substance remains on the body, the more severe the symptoms and the greater the danger of spreading the substance to other personnel and equipment. Emergency medical conditions should always be addressed (unless significant hazard to medical staff exists) prior to radioactive decontamination.

Within the limits imposed by operating in full protective gear, such life-saving procedures as controlling massive hemorrhage or administering of nerve agent antidote, should be carried out before decontamination. This is true even if a liquid agent is present. It is imperative to remember that in a mass casualty situation triage is essential to provide the greatest good to the greatest number of people. This means that some casualties will be beyond the treatment capabilities of the location. If these casualties can be stabilized without jeopardizing the mission of the treatment facility, they should be treated. Otherwise, treatment priority is to those who can be returned to duty the quickest.

Medical personnel must take all reasonable precautions to protect themselves while handling contaminated casualties. This means wearing full protective gear, including mask and gloves.

Mass casualty decontamination and triage is discussed in the chapter of the *HM 1 & C* RTM entitled Medical Aspects of Chemical, Biological, and Radiological Defense.

APPENDIX 1

COMMONLY USED ABBREVIATIONS

A

AA	Alcoholics Anonymous
ACTH	adrenocorticotropic hormone
ADH	antidiuretic hormone
AME	aviation medical examiner

B

BP	blood pressure
BUMED	Bureau of Medicine and Surgery
BUPERSMAN	Bureau of Naval Personnel Manual
BW	biological warfare

C

C	Celcius (centigrade)
CAAC	Counseling and Assistance Center
CBC	complete blood count
CBR	chemical, biological, and radiological (warfare)
CNS	central nervous system
CW	chemical warfare

D

DC	Dental Corps
DCL	document control listing
DCO	damage control officer
DME	diving medical examination
DOD	Department of Defense
DODMRB	Department of Defense Medical Review Board
DODPM	Department of Defense Military Pay and Allowances Entitlements Manual

E

ea	each
ECG	electrocardiogram
EENT	eye, ear, nose, and throat
EXAM	examination

F

F	Fahrenheit
FAC	free available chlorine
FSC	Federal Supply Catalog

G

g	gram
gr	grain

H

Hg	mercury
HG	hemoglobin

I

IM	intramuscular
I&O	intake and output
IV	intravenous

J

JAG	Judge Advocate General
JUMPS	Joint Uniform Military Pay System

K

K	potassium

L

l	liter
LAB	laboratory
LES	Leave and Earnings Statement

M

m	meter
MAPMIS	Manpower and Personnel Management Information System
MC	Medical Corps
mg	milligram
ml	milliliter
mm	millimeter
MMPA	military member's pay account
MO	medical officer
MSC	Medical Service Corps

N

NAPS	Naval Academy Preparatory School
NAVCOMPTMAN	Navy Comptroller Manual
NAVEDTRA	Naval Education and Training
NAVFINCEN	Navy Finance Center
NC	Nurse Corps
NDRC	Naval Drug Rehabilitation Center
NEC	Navy Enlisted Classification
NG	nasogastric
NMPC	Naval Military Personnel Center
NPO	nothing by mouth
NRCC	nonresident career course

O

O_2	oxygen
OBA	oxygen breathing apparatus
OCR	optical character recognition
OJT	on-the-job training
OR	operating room
oz	ounce

P

PAR	personnel advancement requirements
PASS	Pay/Personnel Administrative Support System
PAYPERSMAN	Pay and Personnel Procedures Manual
PDB	paradichlorobenzene
PDR	Physicians' Desk Reference
PO	by mouth
POSTOP	postoperative
PPD	purified protein derivative
PPM	parts per million
PREOP	preoperative

Q

QD	every day
QH	every hour
Q2H	every 2 hours
Q3H	every 3 hours
Q4H	every 4 hours
Q6H	every 6 hours
Q8H	every 8 hours
QID	4 times a day
qt	quart

R

RBC	red blood cell
RTM	Rate Training Manual
RW	radiological warfare

S

SC	subcutaneous

T

tbsp	tablespoonful
TDY	temporary additional duty
TPR	temperature, pulse, and respiration
TSH	thyroid-stimulating hormone
tsp	teaspoonful

U

UIC	unit identification code
USD	United States Dispensatory
USP	United States Pharmacopeia

V

VA	Veterans Administration
VS	vital signs

W

WBC	white blood cell
WHO	World Health Organization

X

X	multiplied by

Y

YOB	year of birth

Z

Zn	zinc

APPENDIX 2

GLOSSARY

The following terms are explained as used in this manual.

A

abduction—Moving an extremity away from the body

abrasion—An area of skin or mucous membrane worn from the body mechanically by some unusual or abnormal process

abscess—A localized collection of pus

acidosis—A condition resulting from acid accumulating in the body

adduction—Bringing an extremity toward the body

adipose—Of a fatty nature

adrenergic—Activated by, characteristic of, or secreting epinephrine or similar substances

adsorbent—A drug which "takes up" other substances by adsorption

adsorption—The attachment of one substance to the surface of another

aerobic—Growing only in the presence of oxygen

albuminuria—Albumin in the urine

alkalosis—A pathogenic condition resulting from accumulation of base in, or loss of acid from, the body

ambulatory—Walking or able to walk

amebacide—A drug that destroys amoeba

anabolism—The constructive process by which the simple products of digestion are converted by living cells into more complex compounds and living matter for cellular growth and repair

anaerobic—Growing only in the absence of oxygen

analgesic—A drug used to relieve pain without producing unconsciousness or impairing mental capacities

anatomy—The science of the structure of the body and the relationship of its parts to each other

anemia—A decrease in certain elements of the blood, especially red cells and hemoglobin

anesthesiologist—A physician who specializes in anesthesiology

anesthesiology—A branch of medicine that studies anesthesia and anesthetics

anesthetist—A registered nurse trained in administering anesthetics

anisocoria—Unequal diameter of the pupils

anodyne—A drug that relieves pain

anorexia—Loss of appetite

anoxia—A lack of oxygen that can result in brain damage anthelmintic—A drug that expels, paralyzes, or kills intestinal worms

antibiotic—A product of living microorganisms that kills or inhibits the growth of undesirable microorganisms

antidote—An agent that counteracts a poison

antigen—A substance which, under certain conditions, is capable of inducing the formation of antibodies and reacting specifically with the antibodies in a detectable manner

antipyretic—A drug that lowers elevated body temperature

antiseptic—A drug that inhibits the growth of microorganisms without necessarily destroying them

apnea—A temporary cessation of breathing

articulation—The place of union or junction between two or more bones of the skeleton

aseptic—Clean; free of pathogenic organisms

astringent—A drug or preparation that produces shrinkage of body membranes, especially mucous membranes

asymptomatic—Having no symptoms

auscultation—The act of listening for sounds within the body, with or without a stethoscope

autolysis—The spontaneous disintegration of tissues or cells by the action of their own enzymes or serum, such as occurs after death and in some pathological conditions

avulsed—A forcible separation; also a part torn from another

B

bactericide—An agent that destroys organisms

bacteriostatic—An agent that inhibits the growth of organisms

biologicals—Medicinal preparations made from living organisms and their products, including serums, vaccines, antigens, and antitoxins

blanching—Turning white

bleb—Blister, bubble

bradycardia—Abnormally slow heartbeat evidenced by a pulse rate of 60 or less

bradypnea—Abnormally slow breathing

bubo—An inflammed swelling of a lymphatic gland, especially in the area of the armpit or groin

buccal—Referring to the cheek

C

carrier—A person or animal that harbors a specific infectious agent in the absence of discernible clinical disease, and serves as a potential source of infection for humans

casts—Urinary sediments formed by coagulation of albuminus material in the kidney tubules

catabolism—A destructive process in which the complex compounds of the digestive process are reduced to more simple substances

cathartics—Drugs that promote bowel movements

Cheyne-Stokes—Breathing characterized by alternating periods of apnea and deep respirations

clammy—Moist and cold

coagulation—Clotting

coaptation—To fit together, as the edges of a wound or the ends of a fractured bone; category of splint

colation—Straining

communicable—Capable of being transmitted from one person to another comminution—The process of physical reduction of a substance to fine particle size

contact—A person or animal known to have been associated with an infected person or animal, or a contaminated environment, and to have had the opportunity to acquire the infection

contamination—Unclean or unsterile due to exposure to pathogens

contracture—A condition of muscle shortening and fibrous tissue development which results in a permanent joint deformity

contusion—A bruise

corrosive—A substance that rapidly destroys or decomposes body tissue at point of contact

crepitus—The cracking or grating sound produced by fragments of fractured bones rubbing together

D

debility—The state of abnormal bodily weakness

debridement—The removal of all foreign matter and devitalized tissue in or about a wound

decantation—Separating liquids from solids by letting the solids settle to the bottom and pouring off the liquid

decerebrate—A person with brain damage that produces certain abnormal neurologic signs

decortication—Removing portions of the cortical substance of a structure or organ, such as the brain, kidney, or lung

decubitus ulcer—Bed or pressure sore

desquamate—To shed, peel, or scale off

diastole—The dilation or period of dilation of the heart, especially of the ventricles

disinfection—The killing of infectious agents outside the body by physical or chemical means applied directly

concurrent—Used during the treatment of a patient with a communicable disease

terminal—Used after a patient with a communicable disease has recovered or is transferred

disinfestation—A physical or chemical means of destroying animal or insect pests in a particular area

dissociate—To separate from a union or association with another

distillation—Converting a liquid to a vapor by applying heat and condensing the vapor back to liquid by cooling

diuresis—Urine excretion in excess of the usual amount

diuretics—Drugs that increase the secretion of urine

dyspnea—Labored or difficult breathing

E

ebullition—Boiling

ecchymosis—A small hemorrhagic spot, larger than a petechia, in the skin or mucous membrane, forming a nonelevated, rounded or irregular, blue or purplish patch

electrolyte—A substance that dissociates into ions in solution or when fused, thereby becoming electrically conducting

elixir—An aromatic, sweetened, hydroalcoholic solution containing medicinal substances

embolus—A clot or other plug brought by the blood from another vessel and forced into a smaller one, thereby obstructing circulation

emetic—A substance that causes vomiting

emollient—A drug which softens, soothes, or smoothes the skin or irritates surfaces

emulsion—A liquid preparation containing two unmixable liquids, an oil and water, one of which is dispersed as globules in the other

encapsulated—Enclosed within a capsule

endemic—The constant presence of a disease in a given locality

enteric—Of or within the intestine

epidemic—The outbreak of disease in a geographic area in excess of normal expectations

epidemiology—The study of epidemics and epidemic diseases

epistaxis—Nose bleed

epizootic—Attacking many animals in a region at the same time

eradicate—Wipe out; destroy

erythema—Redness

erythrocyte—Red blood cell

eupnea—Ordinary, quiet breathing

eutexia—The liquification of solids mixed in a dry state

exsanguination—Extensive loss of blood due to hemorrhage, either internal or external

extension—Straightening or unbending, as in straightening the forearm, leg, or fingers

extravasation—A discharge or escape, such as blood from a vessel into the tissue

extrication—The process of freeing a victim, such as from a wrecked car or flooded compartment

F

flexion—Bending, as in bending an arm or leg

fluid extract—An alcoholic solution of vegetable drugs, of such strength that 1 ml of the solution contains the active ingredients of 1 g of the crude drug

fomite—An object, such as a book, wooden object, or an article of clothing, that is not in itself harmful, but is able to harbor pathogenic microorganisms and thus may serve as an agent of transmission of an infection

fumigation—The destruction of disease producing animals or insects by gaseous agents

fungicide—A drug that kills fungus

fungus—A plant that has no chlorophyll

furuncle—An abscess in the true skin caused by the entry of microorganisms through a hair follicle or sweat gland

fusion—Melting

G

gastrostomy—A surgical opening from the external surface of the body into the stomach, usually for inserting a feeding tube

gavage—Introducing a substance into the stomach through a tube

germicide—An agent that kills germs

gestation—The period of carrying developing offspring in the uterus after conception

glycosuria—Glucose in the urine

gram-negative—A microorganism that does not retain the purple dye of Gram's stain

gram-positive—A microorganism that is stained by the purple dye of Gram's stain

H

hemacytometer—An instrument for estimating the number of blood cells in a measured volume of blood

hematemesis—Vomiting bright red blood

hematochezia—Excreting bright red blood

hematocrit—A determination of the volume percentage of red blood cells in whole blood

hemiplegia—Loss of motion and sensation on one side of the body

hemoglobin—Iron-containing red pigment (heme) combined with a protein substance (globin)

hemolysin—Substance that breaks down red blood cells, thereby liberating hemoglobin

hemoptysis—Coughing up bright red blood

hemostatics—Drugs that control external bleeding by forming an artificial clot

histology—The microscopic study of tissue structure

host—A man or other living animal affording subsistence or lodgment to an infectious agent under natural conditions

hyperglycemia—Abnormally increased content of sugar in the blood

hyperpnea—Increased rate and depth of breathing

hypertension—High blood pressure

hyperthermia—Abnormally high body temperature, especially that induced for therapeutic purposes

hypoglycemia—Low blood sugar

hypopnea—Abnormal shallowness and rapidity of breathing

hypostasis—Poor or stagnant circulation in a dependent part of the body or organ, as in venous insufficiency

hypotension—Low blood pressure

hypothermia—Abnormally low body temperature

hypovolemia—Abnormally decreased volume of circulating fluid (plasma) in the body

hypoxia—Low oxygen content or tension; deficiency of oxygen in the inspired air

I

immunity—A defense mechanism of the body which renders it resistant to certain organisms

incision—A cut, or a wound produced by cutting with a sharp instrument

incompatible—Not suitable for combination or simultaneous administration

incontinent—Unable to control excretory functions

induration—An abnormally hard spot or place

infection—A condition resulting when pathogens enter body tissues, multiply, and cause injury to cells

infectious agent—An organism capable of producing infection or disease

infectious disease—A disease of man and animal resulting from an infection

infestation—Parasitic attack or subsistence, as by insects, mites, or ticks

instruction—A directive containing authority or information having continuing reference value or requiring continuing action

intradermal—Into the dermis

inunction—Rubbing in

ischemia—The lack of blood supply to specific local areas due to constriction or obstruction of the blood vessels

isotonic—A solution having the same salinity as whole blood

K

keratolytic—Removes horny layers of epidermis

L

lacerated—Torn

laceration—A wound made by tearing resulting in jagged edges

lacrimation—The secretion of tears

lacrimators—Tear gases

lactation—The production of milk

latent—Concealed; not manifest; potential

lavage—To wash out

lesion—Any pathological or traumatic discontinuity of tissue or loss of function of a part

leukocyte—White blood cell

leukocytosis—Abnormally high white blood cell count

leukopenia—Abnormally low white blood cell count

levigation—Adding a small amount of liquid to a mortar and pestle while triturating

ligament—A sheet or band of tough, fibrous tissue connecting two or more bones or cartilages, or supporting an organ, fascia, or muscle

liniment—Solution or mixture of various substances in oily, alcoholic, or emulsified form intended for external application

lyophilization—The creation of a stable preparation of a biological substance (blood plasma, serum, etc.) by rapid freezing and dehydration of the frozen product under high vacuum

M

maceration—Soaking

magmas—Thick, creamy, aqueous suspensions of inorganic substances in a very fine state

malaise—A vague feeling of bodily discomfort

mastication—Chewing

materia medica—The study of drugs

medical aseptic technique—The practice that prevents the spread of pathogens from person to person, place to place, or place to person

melena—Excretion of black tarry stools

metabolism—The sum of all the physical and chemical processes by which living, organized substance is produced and maintained. Also, the transformation by which energy is made available to the organism

metamorphosis—Change of shape or structure, particularly a transition from one developmental stage to another, as from larva to adult form

metrology—The science of weights and measures

microorganisms—A minute, living organism invisible to the naked eye

micturition—Voiding; urinating

morbidity rate—An incidence rate which includes all persons in a particular population who become ill during a specific period of time

morphology—The science of forms and structure of organized beings

mortality rate—The number of deaths, reported in a particular population, over a specific period of time, divided by the total population, reported as deaths per 1,000 population mottled—Marked with blotches or spots of different colors or shades

mucus—A sticky substance secreted by mucous membranes

mydriatic—Any drug that dilates the pupil

myelin—A lipid substance that forms a sheath around certain nerve fibers

myelinated—Covered with a myelin sheath

N

necrosis—The death of tissue, usually in small localized areas

nosocomial—Hospital acquired

notice—A directive of a one or limited time nature that has a self cancelling provision, and the same force or effect as an instruction

nutrition—The total process of providing the body with nutriments, and assimilating and using them

O

ointment—A semisolid, fatty, or oily preparation of medicinal substances for external application

oligemia—Deficiency in the volume of blood

ophthalmic—Pertaining to the eye

organism—Any living thing

osmosis—The diffusion of fluids through a membrane or porous partition

ossification—Changing or developing into bone

oxidation—The union of a substance with oxygen

P

palpable—Can be touched or felt

palpitation—An abnormal, rapid, regular or irregular beating of the heart, felt by the patient

paraplegia—Loss of motion and sensation of the lower half of the body

parasiticides—Drugs that kill parasites

parenteral—Administering drugs by injection

paresis—Slight or partial paralysis

paroxysm—A sudden attack, or intensification of the symptoms of a disease, usually recurring periodically

pathogen—An organism capable of producing disease or causing infections

pathogenicity—The capability of an infectious agent to cause disease in a susceptible host

percussion—The act of striking a body part with short, sharp blows as an aid in diagnosing the condition by evaluating the sound obtained

peripheral—Outward part or surface

persistent—Stubborn; persevering

petechia—A round pinpoint, nonraised purplish red spot caused by hemorrhage in the skin

phagocytosis—The ingestion and destruction by phagocytes of cells, microorganisms, and other foreign matter in the blood or tissues

pharmacognosy—The study of the action of drugs and their uses

physiological—Characteristic of or appropriate to an organism's functioning

plexus—Network

posology—The study of dosage and the criteria which influence it

prone—Lying face down

prophylactic—The prevention of disease; preventive treatment

proportion—Two equal ratios considered simultaneously

prostration—Utter exhaustion

pruritus—Intense itching

psychological—Of, belonging to, or of the nature of psychology; the mental process

purulent—Pus filled or containing pus

pustule—A small, inflamed elevation of the skin, containing pus

Q

quadraplegia—Loss of motion and sensation below the neck

R

rales—An abnormal sound, either moist or dry, classified by location e.g., bronchial rales, laryngeal rales

ratio—The relationship of one quantity to another of like units

reservoir—A carrier on which an infectious agent depends primarily for survival

resistance—The sum total of body mechanisms that provide barriers to the invasion of infectious agents or their toxic products

rhinorrhea—The free discharge of a thin nasal mucus

rhonchus—A rattling throat sound due to partial obstruction; also a dry coarse rale in the bronchial tubes

S

sanitization—The process of cleaning with soap and water or boiling to reduce the number of organisms to a safe level

sepsis—The growth of pathogens in living tissue

shock—Collapse of the cardiovascular system, characterized by circulatory deficiency and depression of vital functions

solubility—The ability of a solid to dissolve in a given amount of solvent

spirits—Alcoholic or hydroalcoholic solutions of volatile substances

spore—A microorganism in a resting or dormant state that renders it highly resistant to destruction

sprain—Injury to the ligaments and soft tissues that support a joint

sterile—Free of all living organisms

sterilization—The process of destroying all organisms on a substance or article by exposure to physical or chemical agents; the process by which all organisms, including spores, are destroyed

sternutators—Vomiting gases

stertorous—Snoring type breathing sound

strain—Forcible overstretching or tearing of a muscle or tendon

striated—Striped or streaked

stridor—A harsh, high-pitched respiratory sound such as the inspiratory sound often heard in acute laryngeal obstruction

subcutaneous—Under the skin

sublingual—Under the tongue

superficial—Of or pertaining to the surface, lying on, not penetrating below

supine—Lying on the back

surgical aseptic technique—The practice that renders and keeps objects and areas free from all organisms

surgically clean—Clean but not sterile

susceptible—Not resistant

suspension—A coarse dispersion of finely divided insoluble material suspended in a liquid medium

syncope—Faintness or actual fainting

synergist—A medicine that aids or cooperates with another

syrup—Concentrated aqueous solutions of sucrose, containing flavoring or medicinal substances

T

tachycardia—Excessively rapid heart beat, usually over 100

tachypnea—Quick, shallow breathing

taeniacide—A drug that kills or paralyzes tapeworms

taeniafuge—A drug that expels tapeworms without necessarily killing them

tendon—A fibrous cord by which a muscle is attached to the skeleton

thrombus—A plug or clot in a blood vessel or in one of the cavities of the heart, formed by coagulation of the blood. It remains where it was formed

tincture—Usually an alcoholic solution of animal or vegetable drugs

tinnitus—Ringing in the ears

toxemia—Poisonous products in the blood

toxicology—The science of poisons

toxins—Poisons

tracheostomy—Surgically creating an opening into the trachea

triage—Sorting casualties to determine priority of treatment

trituration—A process of reducing a solid to a very fine powder by grinding in a mortar and pestle

U

urticaria—Hives or welts

uremia—A condition resulting from waste products not being removed efficiently by the kidneys so they remain in the blood

V

vascular—Pertaining to blood vessels

vasoconstrictor—Constricts the blood vessels

vasodilator—Dilates the blood vessels

vermicide—A drug that kills or paralyzes worms

vermifuge—A drug that expels worms without necessarily killing them

vesicant—A blistering drug or agent

vesication—The process of blistering

vesicle—A small blister

virulence—The degree of pathogenicity of a microorganism or its ability to invade the tissues of the host

W

waters—Aqueous solutions of volatile substances

INDEX

A

Abbreviations, commonly used, A1-1 to A1-3
Abdominal cavity, digestive system, 3-47
Abdominal wounds, 4-43
Absorbed poisons, 4-70
Abstract of Service and Medical History (NAVMED 6150/4), 9-33, 9-37
Acids, drug groups, 7-4 to 7-5
  acetic acid, 7-5
  hydrochloric acid, 7-5
Acute febrile respiratory disease, 11-24
Adjunct health record forms and reports, 9-40 to 9-41
  disposition, 9-41
  Narrative Summary (SF 502), 9-40
Administration, 10-1 to 10-18
  Bureau reporting requirements, 10-1 to 10-3
    Appointment Log, 10-3
    DD Form 877, Request for Medical/Dental Records or Information, 10-2
    Medical Journal, 10-2
    NAVMED-S Binnacle List, 10-2
    NAVMED-T Morning Report of Sick, 10-2
    Register of Patients (DD Form 739 or Mechanized Listing), 10-2
    reports to the Officer of the Deck or Day, 10-2
    Sick Call Treatment Log, 10-3
    Statistical Data Log, 10-3
    Training Log, 10-3
    Water Test Log, 10-3
  computers and OCR documents, 10-4
  introduction to optical character recognition documents, 10-4
  maintaining directives, 10-3
Administration—Continued
  preparing, handling, and mailing OCR documents, 10-9 to 10-18
    centering and aligning the paper, 10-9 to 10-10
    control procedures, 10-14 to 10-18
    correction of OCR documents, 10-10 to 10-11
    transmittal of OCR documents, 10-12
  OCR data input documents, 10-7 to 10-8
    OCR nomenclature, 10-7 to 10-8
  role of administration personnel, 10-5 to 10-7
  transmittal letter, 10-8
Administration of medicines, 7-1 to 7-4
  dosage, 7-1 to 7-3
  methods of administering drugs, 7-3 to 7-4
Administrative responsibilities in the laboratory, 6-23 to 6-24
Adrenal glands, endocrine system, 3-44
Adsorbents, 7-6 to 7-11
  activated charcoal USP, 7-6
  antiseptics, germicides, fungicides, parasiticides, bactericides, and bacteriostatics, 7-8 to 7-11
  dusting powders, 7-7
  emollients, 7-7
  expectorants and demulcents, 7-8
  Kaolin mixture with pectin (Kaopectate®), 7-6
  Kaolin NF (China Clay), 7-6
Advancement in rating, 1-4
Agents, chemical, 12-2 to 12-7
  blood agents, 12-4
  choking or lung agents, 12-4
  lacrimators, 12-5
  nerve agents, 12-2
  psychochemical agents, 12-5
  riot control agents, 12-5

465

Agents, chemical—Continued
- screening smokes, 12-6
- sternutators, 12-6
- vesicants, 12-3
- white phosphorus, 12-6 to 12-7

Amebacides, 7-13

Amebiasis, 11-14

Analgesics and antipyretics, 7-16

Anaphylactic reactions, 4-93

Anaphylactic shock, 4-51

Anatomy and physiology, 3-1 to 3-54
- axial skeleton, 3-8
- bones, 3-7
- cell, the, 3-3
- characteristics of living matter, 3-2
- circulatory system, 3-21 to 3-26
  - blood, 3-21
  - blood coagulation, 3-22
  - blood collection systems (venous circulation), 3-26
  - blood vessels, 3-24 to 3-26
  - heart, 3-22 to 3-24
- cranial bones, 3-8
- digestive system, 3-45 to 3-48
  - abdominal cavity, 3-47
  - accessory organs, 3-48
  - esophagus, 3-45
  - large intestines, 3-47
  - mouth, 3-45
  - pharynx, 3-46
  - small intestines, 3-47
  - stomach, 3-46
- endocrine system, 3-42 to 3-45
  - adrenal glands, 3-44
  - gonads, 3-44
  - hypothalamus, 3-42
  - pancreas, 3-45
  - parathyroid glands, 3-44
  - pituitary gland, 3-42 to 3-43
  - thyroid gland, 3-43
- facial bones, 3-9
- female reproductive system, 3-52 to 3-54
  - external genitalia, 3-52
  - fallopian tubes, 3-53
  - mammary glands, 3-54
  - ovaries, 3-53
  - recurring cycles, 3-54
  - uterus, 3-54
  - vagina, 3-54

Anatomy and physiology—Continued
- integumentary system, 3-19 to 3-21
  - skin appendages, 3-20
  - skin function, 3-19
  - skin structure, 3-20
- introduction, 3-1 to 3-2
  - terms of position and direction, 3-1 to 3-2
- joints, 3-14 to 3-15
  - movements, 3-14 to 3-15
- lymphatic system, 3-26 to 3-27
  - lymph, 3-26
  - lymph nodes, 3-27
  - lymph vessels, 3-27
- male reproductive system, 3-50 to 3-52
  - bulbourethral glands, (cowper's glands), 3-52
  - ductus deferens (vas deferens), 3-51
  - ejaculatory duct, 3-51
  - penis, 3-51
  - prostate gland, 3-51
  - scrotum, 3-51
  - semen, 3-52
  - seminal vesicles, 3-51
  - spermatic cords, 3-51
  - testes, 3-51
- muscles, 3-15 to 3-19
  - functional muscles, 3-17 to 3-19
- nervous system, 3-31 to 3-36
  - autonomic nervous system, 3-36
  - central nervous system, 3-32 to 3-34
  - impulse transmission, 3-31
  - neuron, 3-31
  - parasympathetic system, 3-36
  - peripheral nervous system, 3-34 to 3-36
  - sympathetic nervous system, 3-36
- respiratory system, 3-27 to 3-31
  - abnormalities of breathing, 3-30 to 3-31
  - anatomy, 3-27 to 3-30
  - process of respiration, 3-30
- sensory system, 3-36 to 3-42
  - hearing, 3-39 to 3-41
  - other senses, 3-42
  - sight, 3-37 to 3-39
  - smell, 3-37
  - special functions, 3-42
  - taste, 3-37
  - touch, 3-41
- skeletal system, 3-6
- skull, the 3-8

Anatomy and physiology—Continued
  thorax, 3-10 to 3-13
    appendicular skeleton, 3-10 to 3-13
  tissues, 3-3 to 3-6
  urinary system, 3-48 to 3-40
    bladder, 3-50
    kidneys, 3-48 to 3-50
    ureters, 3-50
    urethra, 3-50
  vertebral column, 3-9
Anesthesia, 5-36 to 5-38
  classifications, 5-36 to 5-38
    general, 5-36 to 5-38
    regional, 5-36
Anesthetics, 7-35 to 7-37
Antacids, drug groups, 7-5
  Aluminum Hydroxide gel (Colloidal Aluminum Hydroxide), 7-5
  Magnesia Magna USP (Milk of Magnesia), 7-5
  Sodium bicarbonate, 7-5
Anthelmintics, 7-13
Antibiotics, 7-31 to 7-34
Anticoagulants, 7-27 to 7-29
Anti-psychotic tranquilizers, 7-21
Antiseptics, germicides, fungicides, parasiticides, bactericides, and bacteriostatics, 7-8 to 7-11
Appendicular skeleton, the thorax, 3-10 to 3-13
  lower extremities, 3-12 to 3-13
  upper extremities, 3-10 to 3-12
Appointment Log, 10-3
Assessing and reporting patient care, 5-7 to 5-11
Assessing the patient's condition, first aid, 4-2
Astringents, drug groups, 7-5 to 7-6
  alum, 7-6
  aluminum acetate solution (Burrow's solution), 7-6
  calamine, 7-6
  zinc oxide, 7-6
Autoclaving, preparation of supplies for, 5-21 to 5-22
  general rules, 5-21
  glassware, 5-21
  instruments, 5-21
  rubber/latex materials, 5-22
Autonomic drugs, 7-37 to 7-41
Autonomic nervous system, 3-36
Aviation personnel, physical examination, 9-46 to 9-47
Axial skeleton, anatomy and physiology, 3-8

B

Bandage, 4-23 to 4-35
  barton, 4-29 to 4-31
  battle dressings, 4-33 to 4-35
  cravat, 4-31 to 4-33
  roller, 4-23 to 4-27
  triangular, 4-27 to 4-29
Basic life support, first aid, 4-7 to 4-21
  breathing, 4-13 to 4-18
  circulation, 4-18 to 4-21
  upper airway obstruction, 4-7 to 4-13
Biological agents, 7-42 to 7-45
  examination of parenteral solutions, 7-44 to 7-45
  factors to be remembered in connection with biologicals, 7-44
Bladder, urinary system, 3-50
Blood, circulatory system, 3-21
Blood coagulation, circulatory system, 3-22
Blood collection, clinical laboratory, 6-1 to 6-3
  finger puncture, 6-1
  venipuncture (vacutainer method), 6-2 to 6-3
Blood collection systems (venous circulation, 3-26
Blood count, complete, clinical laboratory, 6-7 to 6-18
  differential white blood cell (leukocyte) count, 6-13 to 6-18
    cell identification, 6-16 to 6-18
    differential count, 6-16
    making smears, 6-15
    staining smears, 6-15
  hematocrit (packed cell volume) determination, 6-11
  hemoglobin determination, 6-9 to 6-11
    Sahli-Hellige test, 6-9 to 6-11
  red blood cell count (erythrocyte count), 6-7 to 6-9
  white blood cell (leukocyte) count, 6-12 to 6-13
Blood vessels, circulatory system, 3-24 to 3-26
Bones, anatomy and physiology, 3-7
Bones, injury to, 4-54 to 4-63
  fracture of the clavicle, 4-58
  fracture of the forearm, 4-55
  fracture of the jaw, 4-60
  fracture of the kneecap, 4-58
  fracture of the lower leg, 4-58
  fracture of the nose, 4-60

- Bones, injury to—Continued
    - fracture of the pelvis, 4-62
    - fracture of the rib, 4-59
    - fracture of the skull, 4-60
    - fracture of the spine, 4-61
    - fracture of the thigh, 4-57
    - fracture of the upper arm, 4-56
- Botulism, 11-15
- Brain, central nervous system, 3-32
- Breathing, first aid, 4-13 to 4-18
    - artificial ventilation, 4-13 to 4-15
    - supportive equipment, 4-15 to 4-18
- Bureau reporting requirements, 10-2

C

- Cardiogenic shock, 4-51
- Cardiovascular drugs, 7-23
- Cathartics, 7-11 to 7-13
- Cell, the, anatomy and physiology, 3-3
- Central nervous system, 3-32 to 3-34
- Central nervous system depressants, 7-18
- Central nervous system stimulants, 7-17
- Characteristics of living matter, 3-2
- Chemical, biological, and radiological warfare, 12-1 to 12-10
    - chemical agents, 12-2 to 12-7
        - blood agents, 12-4
        - choking or lung agents, 12-4
        - lacrimators, 12-5
        - nerve agents, 12-2
        - psychochemical agents, 12-5
        - riot control agents, 12-5
        - screening smokes, 12-6
        - sternutators, 12-6
        - vesicants, 12-3
        - white phosphorus, 12-6 to 12-7
    - chemical and biological weapons, 12-2
    - decontamination, 12-10
    - introduction, 12-1
    - radiological warfare, 12-7 to 12-10
        - action before nuclear explosion, 12-7
        - effects on personnel, 12-7 to 12-10
        - treatment of nuclear casualties, 12-9 to 12-10
- Chemical burns, first aid, 4-84
    - eye, 4-84
- Chest wounds, 4-43
- Chickenpox—herpes zoster (varicella—shingles), 11-16
- Childbirth, emergency, 4-94 to 4-96
    - complications, 4-96
- Cholera, 11-7
- Cholera vaccine, 11-4
- Chronological Record of Medical Care (SF 600), 9-15, 9-22 to 9-27
- Circulation, first aid, 4-18 to 4-21
    - CPR for children and infants, 4-20 to 4-21
    - one rescuer technique, 4-18 to 4-20
    - two rescuer technique, 4-20
- Circulatory system, anatomy and physiology, 3-21 to 3-26
    - blood, 3-21
    - blood coagulation, 3-22
    - blood collection systems (venous circulation), 3-26
    - blood vessels, 3-24 to 3-26
    - heart, 3-22 to 3-24
- Clinical laboratory, 6-1 to 6-24
    - blood collection, 6-1 to 6-3
        - finger puncture, 6-1
        - venipuncture (vacutainer method), 6-2 to 6-3
    - complete blood count, 6-7 to 6-18
        - differential white blood cell (leukocyte) count, 6-13 to 6-18
        - hematocrit (packed cell volume) determination, 6-11
        - hemoglobin determination, 6-9 to 6-11
        - red blood cell count (erythrocyte count), 6-7 to 6-9
        - white blood cell (leukocyte) count, 6-12 to 6-13
    - introduction, 6-1
    - microscope, the, 6-3 to 6-7
        - care of, 6-6 to 6-7
        - use of, 6-5
    - techniques, 6-23 to 6-24
        - administrative responsibilities, 6-23 to 6-24
        - ethics in the laboratory, 6-24
    - urinalysis, 6-18 to 6-23
        - overnight specimen, 6-18
        - preservation of specimens, 6-19
        - random specimen, 6-18
        - routine examination, 6-19 to 6-23
        - specimens, 6-18
        - twenty-four hour specimen, 6-19
- Closing the health record, 9-6 to 9-7
    - desertion, 9-7
    - discharge or death, 9-6
    - supernumeraries, 9-7

468

- Coagulants, 7-27
- Cold exposure injury, 4-87 to 4-91
  - general cooling (hypothermia), 4-88
  - later management of cold injury, 4-90 to 4-91
  - local cooling, 4-89
- Communicable diseases, 11-5 to 11-7
  - definitions, 11-5 to 11-7
  - reporting of, 11-7
- Communicable diseases of international importance, 11-7 to 11-31
  - acute febrile respiratory disease, 11-24
  - amebiasis (NAVMED P-5052-7), 11-14
  - botulism, 11-15
  - chickenpox—herpes zoster (varicella—shingles), 11-16
  - cholera (NAVMED P-5052-23), 11-7
  - dengue fever (NAVMED P-5052-30), 11-16
  - gonorrhea (gonococcal urethritis, clap, strain), 11-30
  - herpes genitalis, 11-31
  - influenza, 11-19
  - malaria (NAVMED P-5052-10 and BUMEDINST 6230.11 series), 11-20
  - measles (morbilli, hard measles, rubeola, red measles), 11-20
  - meningococcal meningitis (NAVMED P-5052-32), 11-21
  - mumps (infectious parotitis), 11-22
  - nongonococcal urethritis, 11-30
  - pediculosis (lousiness), 11-22
  - plague (NAVMED P-5052-18), 11-8 to 11-10
  - pneumococcal pneumonia, 11-23
  - poliomyelitis (infantile paralysis) (NAVMED P-5052-2), 11-24
  - rabies (hydrophobia), 11-25
  - relapsing fever, 11-10
  - ringworm, 11-25
  - rubella (German measles), 11-21
  - sexually transmitted diseases (venereal diseases) (NAVMED P-5052-11), 11-29
  - shigellosis (bacillary dysentery) (NAVMED P-5052-28), 11-17
  - smallpox, 11-12
  - staphylococcal infections (NAVMED P-5052-16), 11-27
  - streptococcal diseases caused by group A (beta hemolytic) streptococci (NAVMED P-5052-17), 11-26
  - syphilis, 11-31
- Communicable diseases of international importance—Continued
  - tetanus (lockjaw), 11-28
  - tuberculosis (NAVMED P-5052-20), 11-28
  - typhoid fever (enteric fever), 11-29
  - typhus-fever, epidemic louse-borne (NAVMED P-5052-3), 11-11
  - viral hepatitides, 11-17 to 11-19
  - viral pneumonia (excluding influenza), 11-23
  - yellow fever, 11-13
- Communication skills, patient care, 5-4 to 5-7
  - contact point, 5-6
  - therapeutic communications, 5-7
- Compounding pharmacy, 8-13 to 8-18
  - ethics, 8-13
  - heat, 8-14 to 8-15
  - pharmaceutical balances, 8-17 to 8-18
  - pharmaceutical instruments, 8-16
  - pharmaceutical processes, 8-13
- Computers and OCR documents, administration, 10-4
- Conversion, pharmacy, 8-4
  - conversion table for weights and liquid measures, 8-4
- Cranial bones, anatomy and physiology, 3-8
- Cranial nerves, peripheral nervous system, 3-35
- Custody of health record, 9-7 to 9-10
  - cross-servicing health records, 9-8
  - lost, damaged, or destroyed records, 9-8 to 9-10
  - transfers to ships or stations, 9-8
- CVA, cerebrovascular accident, 4-92

D

- Decontamination, 12-10
- Dengue fever, 11-16
- Dental Corps, orientation, 2-2
- Dental Folder (DD 722-1), 9-33 to 9-36
- Dental Record (SF 603), 9-32
- Dental Technicians, orientation, 2-3
- Depressants, miscellaneous, 7-19
- Determining the problem, first aid, 4-2
- Diabetic conditions, emergencies, 4-91 to 4-92
  - diabetic coma, 4-91
  - insulin shock, 4-92
- Differential white blood cell (leukocyte) count, CBC, 6-13 to 6-18

Digestive system, anatomy and physiology, 3-45 to 3-48
  abdominal cavity, 3-47
  accessory organs, 3-48
  esophagus, 3-46
  large intestines, 3-47
  mouth, 3-45
  pharynx, 3-46
  small instestines, 3-47
  stomach, 3-46
Directives, maintaining, 10-4
Diuretics, 7-14
Diving duty, physical examination, 9-46
Drowning, 4-94
Drug abuse, 4-76 to 4-81
  alcohol intoxication, 4-78
  barbiturate intoxication, 4-79
  cannabis intoxication, 4-80
  hallucinogen intoxication, 4-80
  handling drug-intoxicated persons, 4-80 to 4-81
  narcotic intoxication, 4-78
  nonbarbiturate tranquilizer intoxication, 4-79
  stimulant intoxication, 4-79
Drug classification, 7-4
  chemical, 7-4
    pharmaceutical, 7-4
  general, 7-4
  pharmacological, 7-4
Drug groups, 7-4 to 7-6
  acids, 7-4 to 7-5
  antacids, 7-5
  astringents, 7-5 to 7-6
Dusting powders, adsorbents, 7-7
Duties, Hospital Corpsman, 1-1

E

Electrical burns, first aid, 4-83
Emergencies, common medical, 4-91 to 4-96
  anaphylactic reactions, 4-93
  cerebrovascular accident, 4-92
  childbirth, 4-94 to 4-96
  diabetic conditions, 4-91 to 4-92
  drowning, 4-94
  epilepsy, 4-94
  fainting (syncope), 4-91
  heart conditions, 4-93 to 4-94
Emmollients, adsorbents, 7-7
Endocrine system, 3-42 to 3-45
  adrenal glands, 3-44
  gonads, 3-44
  hypothalamus, 3-42
  pancreas, 3-45
  parathyroid glands, 3-44
  pituitary gland, 3-42 to 3-43
  thyroid gland, 3-43
Environmental injuries, first aid, 4-81 to 4-91
  chemical burns, 4-84
  cold exposure injury, 4-87 to 4-91
  electrical burns, 4-83
  heat exposure injury, 4-85 to 4-87
  sunburn, 4-83
  thermal burns, 4-81 to 4-83
  white phosphorus burns, 4-85
Epilepsy, 4-94
Equipment and supplies, first aid, 4-6
Esophagus, digestive system, 3-46
Ethics in the laboratory, 6-24
Ethics, professional, patient care, 5-2
Evaluating the diagnostic and VS, 4-2
Examining for medical problems, 4-5
Examining for trauma-related problems, 4-3 to 4-4
Expectorants and demulcents, adsorbents, 7-8
Eye wounds, 4-41

F

Facial bones, anatomy and physiology, 3-9
Facial wounds, 4-42
Fainting (syncope), 4-91
Female reproductive system, 3-52 to 3-54
  external genitalia, 3-52
  fallopian tubes, 3-53
  mammary glands, 3-54
  ovaries, 3-53
  recurring cycles, 3-54
  uterus, 3-54
  vagina, 3-54
Finger puncture, blood collection, 6-1
First aid and emergency procedures, 4-1 to 4-111
  assessing the patient's condition, 4-2
  basic life support, 4-7 to 4-21
    breathing, 4-13 to 4-18
    circulation, 4-18 to 4-21
    upper airway obstruction, 4-7 to 4-13

First aid and emergency procedures—Continued
  common medical emergencies, 4-91 to 4-96
    anaphylactic reactions, 4-93
    cerebrovascular accident, 4-92
    childbirth, 4-94 to 4-96
    diabetic conditions, 4-91 to 4-92
    drowning, 4-94
    epilepsy, 4-94
    fainting (syncope), 4-91
    heart conditions, 4-93 to 4-94
  determining the problem, 4-2
  developing the medical history, 4-5
  environmental injuries, 4-81 to 4-91
    chemical burns, 4-84
    cold exposure injury, 4-87 to 4-91
    electrical burns, 4-83
    heat exposure injury, 4-85 to 4-87
    sunburn, 4-83
    thermal burns, 4-81 to 4-83
    white phosphorus burns, 4-85
  equipment and supplies, 4-6
  evaluating the diagnostic and VS, 4-2
  examining for medical problems, 4-5
  examining for trauma-related problems, 4-3 to 4-4
  general first aid rules, 4-1
  general considerations, 4-1
  injuries to bones, joints, and muscles, 4-53 to 4-66
    bones, 4-54 to 4-63
    joints and muscles, 4-63 to 4-66
    use of splints, 4-54
  poisons and drug abuse, 4-66 to 4-81
    absorbed poisons, 4-70
    drug abuse, 4-76 to 4-81
    general treatment, 4-66
    ingested poisons, 4-67 to 4-69
    injected poisons, 4-70 to 4-76
    obtaining information, 4-66
    poisons by inhalation, 4-69 to 4-70
  rescue and transportation procedures, 4-96 to 4-111
    protective equipment, 4-96 to 4-98
    rescue procedures, 4-99 to 4-109
    transportation of the injured, 4-109 to 4-111
  shock, 4-49 to 4-53
    general treatment, 4-52 to 4-53
    types, 4-50 to 4-52

First aid and emergency procedures—Continued
  soft tissue injuries, 4-21 to 4-49
    abdominal wounds, 4-43
    chest wounds, 4-43
    classification of wounds, 4-21
    considerations in wound treatment, 4-40
    eye wounds, 4-41
    facial wounds, 4-42
    head wounds, 4-42
    management of internal soft tissue injury, 4-38 to 4-39
    management of open soft tissue injury, 4-22 to 4-38
    removing foreign objects, 4-45
    wound closing, 4-45 to 4-49
  triage, 4-7

Food and fluid therapy, medical patient, 5-33

Food sanitation, 11-32 to 11-33
  health standards for food service personnel, 11-32
  training and hygiene of food personnel, 11-32 to 11-33

Foreign objects, removing, 4-45

Formulas and doses, reducing and enlarging, pharmacy, 8-4 to 8-6
  enlarging doses, 8-5 to 8-6
  enlarging formulas, 8-5
  reducing doses, 8-5
  reducing formulas, 8-4

G

Glossary, A2-1 to A2-9

Gonads, endocrine system, 3-44

Gonorrhea (gonococcal urethritis, clap, strain), 11-30

H

Health and illness, patient care, 5-1

Health education, patient care, 5-11

Health Record Jacket (DD Form 722) and Dental Folder (DD Form 722-1), 9-10

- Health records and physical examinations, 9-1 to 9-50
  - health records, 9-1 to 9-41
    - Abstract of Service and Medical History (NAVMED 6150/4), 9-33, 9-37
    - adjunct health record forms and reports, 9-40 to 9-41
    - Chronological Record of Medical Care (SF 600), 9-15, 9-22 to 9-27
    - closing the health record, 9-6 to 9-7
    - contents, 9-1 to 9-3
    - custody of health record, 9-7 to 9-10
    - Dental Folder (DD 722-1), 9-33 to 9-36
    - Dental Record (SF 603), 9-32
    - Health Record Jacket (DD Form 722 and Dental Folder 722-1), 9-10
    - Immunization Record (SF 601), 9-27 to 9-32
    - Individual Sick Slip (DD 689), 9-41
    - opening the health record, 9-5 to 9-6
    - Record Identifier for Personnel Reliability (NAVPERS 5510/1), 9-10
    - Record of Occupational Exposure to Ionizing Radiation (DD Form 1141), 9-40
    - release of medical information, 9-3 to 9-5
    - Report of Medical Examination (SF 88), 9-10 to 9-21
    - Special Duty Medical Abstract (NAVMED 6150/2), 9-37 to 9-40
    - verification, 9-3
  - physical examinations, 9-41 to 9-50
    - active duty officers (triennial annual), 9-43
    - annual exam of certain enlisted members, 9-44
    - aviation personnel, 9-46 to 9-47
    - candidates for commission or warrant, 9-47
    - candidates for service academies, ROTC 4 year Scholarship Program, and Naval Academy Preparatory Schools (NAPS), 9-47
    - diving duty, 9-46
    - enlistment and reenlistment, 9-42
    - former members physically disqualified for reenlistment when separated, 9-47
    - physical defects and waivers, 9-49
    - recruit screening examination, 9-43
- Health records and physical examinations—Continued
  - physical examinations—Continued
    - Reserve components, Navy and Marine Corps personnel not on active duty, 9-48
    - retired members ordered to active duty, 9-48
    - separation from active duty, 9-45
    - submarine personnel, 9-46
    - transfer of personnel, 9-46
    - validity periods for reports of medical examination, 9-49
    - weight control, 9-49 to 9-50
- Healthful living ashore and afloat, 11-32 to 11-44
  - control of insects and carriers, 11-37 to 11-44
  - food sanitation, 11-32 to 11-33
  - vector and economic pest control, 11-33 to 11-36
- Heart, circulatory system, 3-22 to 3-24
- Heart conditions, 4-93 to 4-94
  - acute myocardial infarction, 4-93
  - angina pectoris, 4-93
  - congestive heart failure, 4-94
- Heat exposure injury, 4-85 to 4-87
  - heat cramps, 4-85
  - heat exhaustion, 4-86
  - heat stroke, 4-86
  - prevention, 4-87
- Hematocrit (packed cell volume) determination, CBC, 6-11
- Hemoglobin determination, CBC, 6-9 to 6-11
- Hemorrhage, 4-22 to 4-23
- Hemostatics, 7-27
- Herpes genitalis, 11-31
- Hospital corpsman, 1-1 to 1-11
  - advancement in rating, 1-4
  - desirable skills, 1-2
  - duties, 1-1
  - how to prepare for advancement, 1-5 to 1-10
    - Bibliography for Advancement Study, 1-8 to 1-9
    - Occupational Standards Manual, 1-5 to 1-8
    - Personnel Advancement Requirements, 1-8
    - rate training manuals, 1-9 to 1-10

Hospital corpsman—Continued
  integrity, 1-3
  leadership, 1-3
  Navy enlisted advancement system, 1-4
    qualifying for advancement, 1-4
  patient relationship, 1-2
  personal traits, 1-3
    financial responsibility, 1-3
    personal appearance, 1-3
  professional ethics, 1-2
    your first responsibility is to your patient, 1-2
    your second responsibility is to the team, 1-2
    your third responsibility is to the Hospital Corps, 1-2
  responsibility, 1-1
  sources of information, 1-10 to 1-11
    training films, 1-11
  who will be advanced?, 1-5
Hospital Corpsman and clinical laboratory techniques, 6-23
  administrative responsibilities in the laboratory, 6-23 to 6-24
    filing the laboratory requests, 6-24
    patient identification, 6-23
    specimen identification, 6-23
    use of laboratory forms, 6-24
  ethics in the laboratory, 6-24
Hospital Corps, orientation, 2-2
Hygiene, environmental, 5-16 to 5-17
  hygiene, 5-16 to 5-17
Hypothalamus, endocrine system, 3-42
Hypovolemic shock, 4-50

I

Immunization Record (SF 601), 9-27 to 9-32
  Syphilis Record (SF 602), 9-29 to 9-32
Immunizations, preventive medicine, 11-1 to 11-5
  intervals, 11-3
  preservation and disposition of biologicals, 11-2
  record of, 11-4 to 11-5
  routine immunizations, 11-3 to 11-4
    cholera vaccine, 11-4
    influenza vaccine, 11-4
    oral poliovirus vaccine, 11-4
    plague vaccine, 11-4

Immunizations, preventive medicine—Continued
  routine immunizations—Continued
    smallpox vaccine, 11-3
    tetanus-diphtheria toxoid, 11-4
    typhoid vacccine (killed and dried with acetone), 11-4
    yellow fever vaccine, 11-4
  special immunizations, 11-4
  vaccination precautions, 11-2

Impulse transmission, nervous system, 3-31

Incompatabilities, pharmacy, 8-21 to 8-22
  chemical, 8-22
  manifestations of incompatibility, 8-22
  physical, 8-22
  therapeutic, 8-21

Individual Sick Slip (DD 689), 9-41

Influenza, 11-19

Influenza vaccine, 11-4

Ingested poisons, 4-67 to 4-69
  corrosives, 4-68
  noncorrosives, 4-67
  petroleum distillates, 4-68
  shellfish and fish poisoning, 4-69

Inhalation, poisons by, 4-69 to 4-70

Injected poisons, 4-70 to 4-76
  bee, wasp, and fire ant stings, 4-71
  bites, stings, and punctures from sea animals, 4-75 to 4-76
  scorpion stings, 4-71
  snakebites, 4-72 to 4-75
  spider bites, 4-71

Injuries to bones, joints, and muscles, 4-53 to 4-66
  bones, 4-54 to 4-63
  joints and muscles, 4-63 to 4-66
  use of splints, 4-54

Insects and carriers, control of, 11-37 to 11-44

Integrity, Hospital Corpsman, 1-3

Integumentary system, anatomy and physiology, 3-19 to 3-21
  skin appendages, 3-20 to 3-21
  skin function, 3-19
  skin structure, 3-20

Intestines, digestive system, 3-47
  large, 3-47
  small, 3-47

J

Joints and muscles, injury to, 4-63 to 4-66
  contusions, 4-65 to 4-66
  dislocations, 4-63 to 4-65
  sprains, 4-65
  strains, 4-65
Joints, anatomy and physiology, 3-14 to 3-15
  movements, 3-14 to 3-15

K

Kidneys, urinary system, 3-48 to 3-50

L

Leadership, 1-3
Lymphatic system, anatomy and physiology, 3-26 to 3-27
  lymph, 3-26
  lymph nodes, 3-27
  lymph vessels, 3-27

M

Malaria, 11-20
Male reproductive system, 3-50 to 3-52
  bulbourethral glands (Cowper's glands), 3-52
  ductus deferens (vas deferens), 3-51
  ejaculatory duct, 3-51
  penis, 3-51
  prostrate gland, 3-51
  scrotum, 3-51
  semen, 3-52
  seminal vesicles, 3-51
  spermatic cords, 3-51
  testes, 3-51
Materia medica, 7-1
Mathematics, pharmacy, 8-6 to 8-13
  decimals, 8-6
  fractions, 8-7 to 8-9
  percentage, 8-9
  ratio and proportion, 8-10 to 8-13
  specific gravity, 8-13
Measles (morbilli, hard measles, rubeola, red measles), 11-20
Medical Corps, orientation, 2-1
Medical Department of the Navy, orientation, 2-1
Medical Journal, 10-2
Medical Service Corps, orientation, 2-2
Medications, medical patient, 5-33
Meningococcal meningitis, 11-21
Metrology, pharmacy, 8-1 to 8-4
  Apothecary system, 8-2
  Avoirdupois system, 8-2
  converting weights and measures, 8-2, 8-4
  metric system, 8-2
  table of weights and measures, 8-2, 8-3
Microscope, the, clinical laboratory, 6-3 to 6-7
  care of, 6-6 to 6-7
  use of, 6-5
Morphine administration, 4-52 to 4-53
Mouth, digestive system, 3-45
Mumps (infectious parotitis), 11-22
Muscles, anatomy and physiology, 3-15 to 3-19
  functional muscles, 3-17 to 3-19
Myocardial drugs, 7-24

N

NAVMED-S Binnacle List, 10-2
NAVMED-T Morning Report of Sick, 10-2
Navy enlisted advancement system, 1-4 to 1-10
  how to prepare for advancement, 1-5 to 1-10
    Bibliography for Advancement Study, 1-8 to 1-9
    Occupational Standards Manual, 1-5 to 1-8
    Personnel Advancement Requirements, 1-8
    rate training manuals, 1-9 to 1-10
  qualifying, 1-4
  who will be advanced?, 1-5
Nervous system, anatomy and physiology, 3-31 to 3-36
  autonomic nervous system, 3-36
  central nervous system, 3-32 to 3-34
    brain, 3-32
    spinal cord, 3-33 to 3-34
  impulse transmission, 3-31
  neuron, 3-31
  parasympathetic system, 3-36
  peripheral nervous system, 3-34 to 3-36
    cranial nerves, 3-35
    spinal nerves, 3-35 to 3-36
  sympathetic nervous system, 3-36

474

Neurogenic shock, 4-51
Neuromuscular blocking agents, 7-23
Neuron, nervous system, 3-31
Nongonococcal urethritis, 11-30
Nurse Corps, orientation, 2-2
Nutrition, patient care, 5-28 to 5-32
    adequate diet, 5-30
    diet therapy, 5-31 to 5-32
    metabolism, 5-29 to 5-30
        basal metabolic rate, 5-30
        caloric value of foods, 5-30
    substances, 5-28

O

OBA, oxygen breathing apparatus, 4-96
OCR data input documents, 10-7 to 10-8
    OCR nomenclature, 10-7 to 10-8
OCR documents, preparing, handling and mailing, 10-9 to 10-18
    centering and aligning the paper, 10-9 to 10-10
    control procedures, 10-14 to 10-18
    correction of OCR documents, 10-10 to 10-11
    transmittal of OCR documents, 10-12
Opening the health record, 9-5 to 9-6
    enlisted members, 9-6
    officers, 9-5
Operating room, cleaning, surgical aseptic technique, 5-25 to 5-27
Operating room, general safety precautions, 5-27 to 5-28
Operative, surgical patient, 5-35 to 5-38
    anesthesia, 5-36 to 5-38
Orthopedic patient, patient care, 5-40
Opium and its alkaloids, 7-20
Optical character recognition documents, introduction to, 10-4
Oral poliovirus vaccine, 11-4
Orientation, 2-1 to 2-3
    Medical Department of the Navy, 2-1
    Medical Department personnel, 2-1 to 2-3
        Dental Corps, 2-2
        Dental Technicians, 2-3
        Hospital Corps, 2-2
        Medical corps, 2-1
        Medical Service Corps, 2-2
        Nurse Corps, 2-2

P

Pancreas, endocrine system, 3-45
Parasympathetic nervous system, 3-36
Parathyroid glands, endocrine system, 3-44
Pathogenic organism control, 5-17 to 5-27
    medical asepsis, 5-17
    surgical aseptic technique, 5-18 to 5-27
        basic guidelines, 5-19
        cleaning the operating room, 5-25 to 5-27
        handling sterile articles, 5-22
        methods of sterilization, 5-20 to 5-21
        preparation of supplies for autoclaving, 5-21 to 5-22
        surgical hand scrub, gowning, and gloving, 5-22 to 5-25
Patient care, 5-1 to 5-41
    assessing and reporting, 5-7 to 5-11
    communication skills, 5-4 to 5-7
        contact point, 5-6
        therapeutic communciations, 5-7
    environmental hygiene, 5-16 to 5-17
        hygiene, 5-16 to 5-17
    general safety precautions in the operating room, 5-27 to 5-28
    health and illness, 5-1
    health education, 5-11
    interpersonal relations, 5-3 to 5-4
        culture, 5-3
        race, 5-3
        religion, 5-4
        sex, 5-4
    introduction, 5-1
    medical patient, 5-32 to 5-34
        food and fluid therapy, 5-33
        medications, 5-33
        patient teaching, 5-33
        rest, 5-34
        test and procedures, 5-32
    nutrition, 5-28 to 5-32
        adequate diet, 5-30
        diet therapy, 5-31 to 5-32
        metabolism, 5-29 to 5-30
        substances, 5-28
    orthopedic patient, 5-40
    pathogenic organism control, 5-17 to 5-27
        medical asepsis, 5-17
        surgical aseptic technique, 5-18 to 5-27
    patient, the, 5-1 to 5-2
    professional ethics, 5-2

Patient care—Continued
  professional practice, 5-11 to 5-13
  safety aspects, 5-13
    environmental safety, 5-13 to 5-16
    general guidelines, 5-16
  surgical patient, 5-34 to 5-40
    operative, 5-35 to 5-38
    postoperative, 5-39 to 5-40
    preoperative, 5-34
    recovery, 5-38 to 5-39
  terminally ill patient, 5-40 to 5-41

Patient relationship, 1-2

Pediculosis (lousiness), 11-22

Peripheral nervous system, 3-34 to 3-36

Personal traits, 1-3
  financial responsibility, 1-3
  personal appearance, 1-3

Personnel, Medical Department, 2-1 to 2-3
  Dental Corps, 2-2
  Dental Technicians, 2-3
  Hospital Corps, 2-2
  Medical corps, 2-1
  Medical Service Corps, 2-2
  Nurse Corps, 2-2

Pest control, vector and economic, 11-33 to 11-36
  Department of Defense standards, 11-33, 11-36
  entomological services, 11-33 to 11-35
  pesticide hazards, 11-36
  pesticide storage and transportation, 11-36
  training and certification, 11-33

Pharmaceutical preparations, 8-18 to 8-21
  capsules, 8-21
  elixirs, 8-19
  emulsions, 8-20
  fluid extracts, 8-19
  liniments, 8-20
  lotions, 8-20
  magmas (aka milks), 8-19
  ointments, 8-21
  spirits, 8-19
  suppositories, 8-21
  suspensions, 8-20
  syrups, 8-19
  tinctures, 8-18
  waters (aquae), 8-18

Pharmacology and toxicology, 7-1 to 7-52
  administration of medicines, 7-1 to 7-4
    dosage, 7-1 to 7-3
    methods of administering drugs, 7-3 to 7-4
  adsorbents, 7-6 to 7-11
    antiseptics, germicides, fungicides, parasiticides, bactericides, and bacteriostatics, 7-8 to 7-11
    dusting powders, 7-7
    emollients, 7-7
    expectorants and demulcents, 7-8
  amebacides, 7-13
  analgesics and antipyretics, 7-16
  anesthetics, 7-35 to 7-37
  anthelmintics, 7-13
  antibiotics, 7-31 to 7-34
  anticoagulants, 7-27 to 7-29
  anti-psychotic tranquilizers, 7-21
  autonomic drugs, 7-37 to 7-41
  biological agents, 7-42 to 7-45
    examinations of parenteral solutions, 7-44 to 7-45
    factor to be remembered in connection with biologicals, 7-44
  cardiovascular drugs, 7-23
  cathartics, 7-11 to 7-13
  central nervous system depressants, 7-18
  central nervous system stimulants, 7-17
  coagulants, 7-27
  diuretics, 7-14
  drug classification, 7-4
    chemical, 7-4
    general, 7-4
    pharmacological, 7-4
  drug groups, 7-4 to 7-6
    acids, 7-4 to 7-5
    antacids, 7-5
    astringents, 7-5 to 7-6
  hemostatics, 7-27
  materia medica, 7-1
  miscellaneous depressants, 7-19
  myocardial drugs, 7-24
  neuromuscular blocking agents, 7-23
  opium and its alkaloids, 7-20
  sedatives/hypnotics, 7-23
  skeletal muscle relaxants, 7-22
  sulfonamides, 7-29 to 7-31
  therapeutics, 7-1

473

Pharmacology and toxicology—Continued
  toxicology, 7-45 to 7-52
    antidotes and antidote lockers, 7-50 to 7-52
    classification of poisons, 7-46
    drug definitions, 7-49
    effects and symptoms of poisons, 7-46
    emetics, 7-49
    treatment of poisoning, 7-47 to 7-49
  tranquilizing drugs, 7-23
  vasoconstrictors, 7-25 to 7-26
  vasodilators, 7-24
  water, 7-14 to 7-16
Pharmacy, 8-1 to 8-23
  compounding, 8-13 to 8-18
    ethics, 8-13
    heat, 8-14 to 8-15
    pharmaceutical balances, 8-17 to 8-18
    pharmaceutical instruments, 8-16
    pharmaceutical processes, 8-13
  conversion, 8-4
  incompatabilities, 8-21 to 8-22
    chemical, 8-22
    manifestations of incompatibility, 8-22
    physical, 8-22
    therapeutic, 8-21
  introduction, 8-1
  mathematics, 8-6 to 8-13
    decimals, 8-6
    fractions, 8-7 to 8-9
    percentage, 8-9
    ratio and proportion, 8-10 to 8-13
    specific gravity, 8-13
  metrology, 8-1 to 8-4
    Apothecary system, 8-2
    Avoirdupois system, 8-2
    converting weights and measures, 8-2, 8-4
    metric system, 8-2
    tables of weights and measures, 8-2, 8-3
  pharmaceutical preparations, 8-18 to 8-21
    capsules, 8-21
    elixirs, 8-19
    emulsions, 8-20
    fluid extracts, 8-19
    liniments, 8-20
    lotions, 8-20
    magmas (aka milks), 8-19
    ointments, 8-21
    spirits, 8-19
Pharmacy—Continued
  pharmaceutical preparations—Continued
    suppositories, 8-21
    suspensions, 8-20
    syrup, 8-19
    tinctures, 8-18
    waters (aquae), 8-18
  practical pharmacy procedures, 8-22 to 8-23
    compounding, 8-22
    dispensing, 8-23
  publications of pharmacy, 8-1
  reducing and enlarging formulas and doses, 8-4 to 8-6
Pharynx, digestive system, 3-46
Physical examinations, 9-41 to 9-50
  active duty officers (triennial/annual), 9-43
  annual exam of certain enlisted members, 9-44
  aviation personnel, 9-46 to 9-47
  candidates for commission or warrant, 9-47
  candidates for service academies, ROTC 4 Year Scholarship Program, and Naval Academy Preparatory Schools (NAPS), 9-47
  diving duty, 9-46
  enlistment and reenlistment, 9-42
  former members physically disqualified for reenlistment when separated, 9-47
  physical defects and waivers, 9-49
  recruit screening examination, 9-43
  Reserve components, Navy and Marine Corps personnel not on active duty, 9-48
  retired members ordered to active duty, 9-48
  separation from active duty,9-45
  submarine personnel, 9-46
  transfer of personnel (officer and enlisted), 9-46
  validity periods for reports of medical examination, 9-49
  weight control, 9-49 to 9-50
Pituitary gland, endocrine system, 3-42 to 3-43
Plague, 11-8 to 11-10
Plague vaccine, 11-4
Pneumococcal pneumonia, 11-23
Poisons and drug abuse, first aid, 4-66 to 4-81
  absorbed poisons, 4-70

Poisons and drug abuse, first aid—Continued
  drug abuse, 4-76 to 4-81
  general treatment, 4-66
  ingested poisons, 4-67 to 4-69
  injected poisons, 4-70 to 4-76
  obtaining information, 4-66
  poisons by inhalation, 4-69 to 4-70
Poliomyelitis (infantile paralysis), 11-24
Postoperative, surgical patient, 5-39 to 5-40
Practical pharmacy procedures, 8-22 to 8-23
  compounding, 8-22
  dispensing, 8-23
Preoperative, surgical patient, 5-34
Pressure points, 4-35 to 4-37
Preventive medicine, 11-1 to 11-46
  communicable diseases, 11-5 to 11-7
    definitions, 11-5 to 11-7
    reporting of, 11-7
  communicable diseases of international importance, 11-7 to 11-31
    acute febrile respiratory disease, 11-24
    amebiasis, 11-14
    botulism, 11-15
    chickenpox—herpes zoster (varicella—shingles), 11-16
    cholera, 11-7
    dengue fever, 11-16
    gonorrhea (gonococcal urethritis, clap, strain), 11-30
    herpes genitalis, 11-31
    influenza, 11-19
    malaria, 11-20
    measles (morbilli, hard measles, rubeola, red measles), 11-20
    meningococcal meningitis, 11-21
    mumps (infectious parotitis), 11-22
    nongonococcal urethritis, 11-30
    pediculosis (lousiness), 11-22
    pneumococcal pneumonia, 11-23
    plague, 11-8 to 11-10
    poliomyelitis (infantile paralysis), 11-24
    rabies (hydrophobia), 11-25
    relapsing fever, 11-10
    ringworm, 11-25
    rubella (German measles), 11-21
    sexually transmitted diseases (venereal diseases), 11-29
    shigellosis (bacillary dysentery), 11-17
    smallpox, 11-12
Preventive medicine—Continued
  communicable diseases of international importance—Continued
    staphylococcal infections, 11-27
    streptococcal diseases caused by group A (beta hemolytic) streptococci, 11-26
    syphilis, 11-31
    tetanus (lockjaw), 11-28
    tuberculosis (NAVMED P-5052-20), 11-28
    typhoid fever (enteric fever), 11-29
    typhus-fever epidemic louse-borne (NAVMED P-5052-3), 11-11
    viral hepatitides, 11-17 to 11-19
    viral pneumonia (excluding influenza), 11-23
    yellow fever, 11-13
  healthful living ashore and afloat, 11-32 to 11-44
    control of insects and carriers, 11-37 to 11-44
    food sanitation, 11-32 to 11-33
    vector and economic pest control, 11-33 to 11-36
  immunizations, 11-1 to 11-5
    intervals, 11-3
    preservation and disposition of biologicals, 11-2
    record of, 11-4 to 11-5
    routine immunizations, 11-3 to 11-4
    special immunizations, 11-4
    vaccination precautions, 11-2
  water supply ashore and afloat, 11-44 to 11-46
    ice, 11-46
    water sources, 11-44
    water supply afloat, 11-45 to 11-46
    water supply ashore, 11-44
Professional ethics, 1-2
  to the Hospital Corps, 1-2
  to the team, 1-2
  to your patient, 1-2

R

Rabies (hydrophobia), 11-25
Radiological warfare, 12-7 to 12-10
  action before nuclear explosion, 12-7
  effects on personnel, 12-7
  treatment of nuclear casualties, 12-9 to 12-10

Record Identifier for Personnel Reliability (NAVPERS 5510/1), 9-10
Record of Occupational Exposure to Ionizing Radiation (DD Form 1141), 9-40
Recovery, surgical patient, 5-38 to 5-39
Red blood cell count (erythrocyte count), CBC, 6-7 to 6-9
Register of Patients (DD Form 739 or Mechanized Listing), 10-2
Relapsing fever, 11-10
Relations, interpersonal, patient care, 5-3 to 5-4
  culture, 5-3
  race, 5-3
  religion, 5-4
  sex, 5-4
Release of medical information, 9-3 to 9-5
Report of Medical Examination (SF 88), 9-10 to 9-21
  Report of Medical History (SF 93), 9-15 to 9-21
Reports to the Officer of the Deck or Day, 10-2
Request for Medical/Dental Records or Information, DD Form 877, 10-2
Rescue and transportation procedures, first aid, 4-96 to 4-111
  protective equipment, 4-96 to 4-98
    asbestos suits, 4-97
    detection devices, 4-98
    hose (air line) masks, 4-97
    lifelines, 4-98
    OBA, 4-96
    protective (gas) masks, 4-97
  rescue procedures, 4-99 to 4-109
    lifts, drags, and carriers, 4-106 to 4-109
    moving the victim to safety, 4-102
    phases of rescue operations, 4-99
    rescue from electrical contact, 4-100
    rescue from fire, 4-99
    rescue from steam-filled spaces, 4-100
    rescue from unventilated compartments, 4-100
    rescue from the water, 4-101
    stages of extrication, 4-99
    stretchers, 4-102 to 4-106
  transportation of the injured, 4-109 to 4-111
    care en route, 4-111
    emergency vehicles, equipment, and supplies, 4-110
Respiratory system, anatomy and physiology, 3-27 to 3-31
  abnormalities of breathing, 3-30 to 3-31
  anatomy, 3-27 to 3-30
  process of respiration, 3-30
Responsibility, Hospital Corpsman, 1-1
Rest, medical patient, 5-34
Ringworm, 11-25
Role of administrative personnel, 10-5 to 10-7
Rubella (German measles), 11-21

S

Safety aspects, patient care, 5-13 to 5-16
  environmental safety, 5-13 to 5-16
  general guidelines, 5-16
Sahli-Hellige test hemoglobin determination, 6-9 to 6-11
Sedatives/hypnotics, 7-23
Sensory system, anatomy and physiology, 3-36 to 3-42
  hearing, 3-39 to 3-41
  other senses, 3-42
  sight, 3-37 to 3-39
    structure of the eye, 3-38
    vision process, 3-39
  smell, 3-37
  special functions, 3-42
  taste, 3-37
  touch, 3-41
Septic shock, 4-51
Sexually transmitted diseases (venereal diseases), 11-29
Shigellosis (bacillary dysentery), 11-17
Shock, first aid, 4-49 to 4-53
  anaphylactic shock, 4-51
  cardiogenic shock, 4-51
  general treatment, 4-52 to 4-53
    morphine administration, 4-52 to 4-53
    pain relief, 4-52
  hypovolemic shock, 4-50
  neurogenic shock, 4-51
  septic shock, 4-51
Sick Call Treatment Log, 10-3
Skeletal muscle relaxants, 7-22
Skeletal system, anatomy and physiology, 3-6
Skills, desirable, 1-2
Skin, integumentary system, 3-19 to 3-21
  appendages, 3-20 to 3-21
  function, 3-19
  structure, 3-20

- Skull, the, anatomy and physiology, 3-8
- Smallpox, 11-12
- Smallpox vaccine, 11-3
- Soft tissue injuries, 4-21 to 4-49
  - abdominal wounds, 4-43
  - chest wounds, 4-43
  - classification of wounds, 4-21 to 4-22
  - eye wounds, 4-41
  - facial wounds, 4-42
  - head wounds, 4-42
  - management of internal soft tissue injury, 4-38 to 4-39
  - management of open soft tissue injury, 4-22 to 4-38
  - removing foreign objects, 4-45
  - special considerations in wound treatment, 4-40
  - wound closing, 4-45 to 4-49
- Sources of information, 1-10 to 1-11
  - training films, 1-11
- Special Duty Medical Abstract (NAVMED 6150/2), 9-37 to 9-40
- Spinal cord, central nervous system, 3-33 to 3-34
  - function, 3-34
- Spinal nerves, peripheral nervous system, 3-35 to 3-36
- Splints, open soft tissue injury, 4-37
- Staphylococcal infections, 11-27
- Statistical Data Log, 10-3
- Sterile articles, handling, 5-22
  - basic rules, 5-22
  - establishing a sterile field, 5-22
- Sterilization, methods of, 5-20 to 5-21
  - chemical, 5-21
  - physical methods, 5-20
    - dry heat, 5-20
    - moist heat, 5-20
- Stomach, digestive system, 3-46
- Streptococcal diseases caused by group A (beta hemolytic) streptococci, 11-26
- Submarine personnel, physical examinations, 9-46
- Sulfonamides, 7-29 to 7-31
- Sunburn, first aid, 4-83
- Surgical hand scrub, gowning and gloving, 5-22 to 5-25
- Suturing, wound closing, 4-46
- Sympathetic nervous system, 3-36
- Syphilis, 11-31

T

- Terminally ill patient, care, 5-40 to 5-41
- Terms of position and direction, anatomy and physiology, 3-1 to 3-2
- Test and procedures, medical patient, 5-32
- Tetanus-diphtheria toxoid, 11-4
- Tetanus (lockjaw), 11-28
- Therapeutics, pharmacology and toxicology, 7-1
- Thermal burns, 4-81 to 4-83
  - aid station care, 4-83
  - first aid, 4-82
- Thorax, anatomy and physiology, 3-10 to 3-13
  - appendicular skeleton, 3-10 to 3-13
- Thyroid gland, endocrine system, 3-43
- Tissues, anatomy and physiology, 3-3 to 3-6
- Tourniquet, open soft tissue injury, 4-37
- Toxicology, 7-45 to 7-52
  - antidotes and antidote lockers, 7-50 to 7-52
  - classification of poisons, 7-46
  - drug definitions, 7-49
  - effects and symptoms of poisons, 7-46
  - emetics, 7-49
  - treatment of poisoning, 7-47 to 7-49
- Training Log, 10-3
- Tranquilizing drugs, 7-23
- Transmittal letter, administration, 10-8
- Triage, first aid, 4-7
  - evacuation, 4-7
  - treatment, 4-7
- Tuberculosis, 11-28
- Typhoid fever (enteric fever), 11-29
- Typhoid vaccine (killed and dried with acetone), 11-4
- Typhus-fever, epidemic louse-borne, 11-11

U

- Upper airway obstruction, 4-7 to 4-13
  - opening the airway (complete obstruction), 4-10 to 4-13
  - opening the airway (partial obstruction), 4-8 to 4-10
- Urinalysis, clinical laboratory, 6-18 to 6-23
  - overnight specimen, 6-18
  - preservation of specimens, 6-19
  - random specimen, 6-18

Urinalysis, clinical laboratory—Continued
  routine examination, 6-19 to 6-23
    albuminuria, 6-21
    clinically significant findings, 6-22 to 6-23
    color, 6-19
    glucosuria, 6-21
    measurement with index refractometer, 6-20
    measurement with urinometer, 6-20
    methods for measuring albumin in urine, 6-21
    methods for measuring glucose, 6-21
    microscopic examination of urine sediment, 6-22
    procedure, 6-22
    reaction, 6-20
    specific gravity, 6-20
    transparency, 6-19
    volume (for 24-hour specimen or when requested), 6-19
  specimens, 6-18
  twenty-four hour specimen, 6-19
Urinary system, anatomy and physiology, 3-48 to 3-50
  bladder, 3-50
  kidneys, 3-48 to 3-50
  ureters, 3-50
  urethra, 3-50

V

Vasoconstrictors, 7-25 to 7-26
Vasodilators, 7-24
Venipuncture (vacutainer method), blood collection, 6-2 to 6-3
Venous circulation, blood collection systems, 3-26
Vertebral column, anatomy and physiology, 3-9
Viral hepatitides, 11-17 to 11-19
Viral pneumonia (excluding influenza), 11-23

W

Water, pharmacology, 7-14 to 7-16
Water supply ashore and afloat, 11-44 to 11-46
  ice, 11-46
  water sources, 11-44
Water supply ashore and afloat—Continued
  water supply afloat, 11-45 to 11-46
    bacteriological testing, 11-46
    calcium hypochlorite, 11-45
    free available chlorine (FAC), 11-45
  water supply ashore, 11-44
    field disinfection of water, 11-44
Water Test Log, 10-3
Weapons, chemical and biological, 12-2
Weight control, physical examinations, 9-49 to 9-50
White blood cell (leukocyte) count, CBC, 6-12 to 6-13
White phosphorus burns, 4-85
Wounds, first aid, 4-21 to 4-49
  abdominal wounds, 4-43
  chest wounds, 4-43
  classification, 4-21
    causes, 4-22
    general condition, 4-21
    location, 4-21
    size, 4-21
    types, 4-21
  considerations in treatment, 4-40
    infection, 4-40
    shock, 4-40
  eye wounds, 4-41
  facial wounds, 4-42
  head wounds, 4-42
  management of internal soft tissue injury, 4-38 to 4-39
    animal bites, 4-39
  management, open soft tissue injury, 4-22 to 4-38
    bandage, 4-23 to 4-35
    elevation, 4-37
    hemorrhage, 4-22 to 4-23
    pressure points, 4-35 to 4-37
    splints, 4-37
    tourniquet, 4-37
  removing foreign objects, 4-45
  wound closing, 4-45 to 4-49
    general principles, 4-48 to 4-49
    preparation of casualty, 4-47
    suturing, 4-46

Y

Yellow fever, 11-13
Yellow fever vaccine, 11-4

HOSPITAL CORPSMAN 3&2

NAVEDTRA 10669-B

Prepared by the Naval Education and Training Program Development
Center, Pensacola, Florida

Your NRCC contains a set of assignments and perforated answer sheets. The Rate Training Manual, Hospital Corpsman 3&2, NAVEDTRA 10669-B , is your textbook for the NRCC. If an errata sheet comes with the NRCC, make all indicated changes or corrections. Do not change or correct the textbook or assignments in any other way.

HOW TO COMPLETE THIS COURSE SUCCESSFULLY

Study the textbook pages given at the beginning of each assignment before trying to answer the items. Pay attention to tables and illustrations as they contain a lot of information. Making your own drawings can help you understand the subject matter. Also, read the learning objectives that precede the sets of items. The learning objectives and items are based on the subject matter or study material in the textbook. The objectives tell you what you should be able to do by studying assigned textual material and answering the items.

At this point you should be ready to answer the items in the assignment. Read each item carefully. Select the BEST ANSWER for each item, consulting your textbook when necessary. Be sure to select the BEST ANSWER from the subject matter in the textbook. You may discuss difficult points in the course with others. However, the answer you select must be your own. Remove a perforated answer sheet from the back of this text, write in the proper assignment number, and enter your answer for each item.

Your NRCC will be administered by your command or, in the case of small commands, by the Naval Education and Training Program Development Center. No matter who administers your course you can complete it successfully by earning a 3.2 for each assignment. The unit breakdown of the course, if any, is shown later under Naval Reserve Retirement Credit.

WHEN YOUR COURSE IS ADMINISTERED BY LOCAL COMMAND

As soon as you have finished an assignment, submit the completed answer sheet to the officer designated to grade it. The graded answer sheet will not be returned to you.

If you are completing this NRCC to become eligible to take the fleetwide advancement examination, follow a schedule that will enable you to complete all assignments in time. Your schedule should call for the completion of at least one assignment per month.

Although you complete the course successfully, the Naval Education and Training Program Development Center will not issue you a letter of satisfactory completion. Your command will make an entry in your service record, giving you credit for your work.

WHEN YOUR COURSE IS ADMINISTERED BY THE NAVAL EDUCATION AND TRAINING PROGRAM DEVELOPMENT CENTER

After finishing an assignment, go on to the next. Retain each completed answer sheet until you finish all the assignments in a unit (or in the course if it is not divided into units). Using the envelopes provided, mail your completed answer sheets to the Naval Education and Training Program Development Center where they will be graded and the score recorded. Make sure all blanks at the top of each answer sheet are filled in. Unless you furnish all the information required, it will be impossible to give you credit for your work. The graded answer sheets will not be returned.

The Naval Education and Training Program Development Center will issue a letter of satisfactory completion to certify successful completion of the course (or a creditable unit of the course). To receive a course-completion letter, follow the directions given on the course-completion form in the back of this NRCC.

You may keep the textbook and assignments for this course. Return them only in the event you disenroll from the course or otherwise fail to complete the course. Directions for returning the textbook and assignments are given on the book-return form in the back of this NRCC.

PREPARING FOR YOUR ADVANCEMENT EXAMINATION

Your examination for advancement is based on the Occupational Standards for your rating as found in the MANUAL OF NAVY ENLISTED MANPOWER AND PERSONNEL CLASSIFICATIONS AND OCCUPATIONAL STANDARDS (NAVPERS 18068). These Occupational Standards define the minimum tasks required of your rating. The sources of questions in your advancement examination are listed in the BIBLIOGRAPHY FOR ADVANCEMENT STUDY (NAVEDTRA 10052). For your convenience, the Occupational Standards and the sources of questions for your rating are combined in a single pamphlet for the series of examinations for each year. These OCCUPATIONAL STANDARDS AND BIBLIOGRAPHY SHEETS (called Bib Sheets), are available from your ESO. Since your textbook and NRCC are among the sources listed in the bibliography, be sure to study both as you take the course. The qualifications for your rating may have changed since your course and textbook were printed, so refer to the latest edition of the Bib Sheets.

NAVAL RESERVE RETIREMENT CREDIT

This course is evaluated at 16 Naval Reserve retirement points which will be credited upon satisfactory completion of the course. These points are creditable to personnel eligible to receive them under current directives governing the retirement of Naval Reserve personnel.

COURSE OBJECTIVE

Upon completion of this nonresident career course, the student will satisfy a major requirement for advancement to HM3 and HM2 by scoring a minimum of 3.2 on each assignment.

While working on this correspondence course, you may refer freely to the text. You may seek advice and instruction from others on problems arising in the course, but the solutions submitted must be the result of your own work and decisions. You are prohibited from referring to or copying the solutions of others, or giving completed solutions to anyone else taking the same course.

Naval courses may include a variety of questions -- multiple-choice, true-false, matching, etc. The questions are not grouped by type; regardless of type, they are presented in the same general sequence as the textbook material upon which they are based. This presentation is designed to preserve continuity of thought, permitting step-by-step development of ideas. Some courses use many types of questions, others only a few. The student can readily identify the type of each question (and the action required) through inspection of the samples given below.

MULTIPLE-CHOICE QUESTIONS

Each question contains several alternatives, one of which provides the best answer to the question. Select the best alternative, and blacken the appropriate box on the answer sheet.

SAMPLE

s-1. The first person to be appointed Secretary of Defense under the National Security Act of 1947 was
1. George Marshall
2. James Forrestal
3. Chester Nimitz
4. William Halsey

Indicate in this way on the answer sheet:

	1 T	2 F	3	4	
s-1	☐	■	☐	☐	_ _ _

TRUE-FALSE QUESTIONS

Mark each statement true or false as indicated below. If any part of the statement is false the statement is to be considered false. Make the decision, and blacken the appropriate box on the answer sheet.

SAMPLE

s-2. Any naval officer is authorized to correspond officially with any systems command of the Department of the Navy without his commanding officer's endorsement.

Indicate in this way on the answer sheet:

	1 T	2 F	3	4	
s-2	☐	■	☐	☐	_ _ _

MATCHING QUESTIONS

Each set of questions consists of two columns, each listing words, phrases or sentences. The task is to select the item in column B which is the best match for the item in column A that is being considered. Items in column B may be used once, more than once, or not at all. Specific instructions are given with each set of questions. Select the numbers identifying the answers and blacken the appropriate boxes on the answer sheet.

SAMPLE

In questions s-3 through s-6, match the name of the shipboard officer in column A by selecting from column B the name of the department in which the officer functions.

A	B
s-3. Damage Control Assistant	1. Operations Department
s-4. CIC Officer	2. Engineering Department
s-5. Disbursing Officer	3. Supply Department
s-6. Communications Officer	

Indicate in this way on the answer sheet:

	1 T	2 F	3	4	
s-3	☐	■	☐	☐	_ _ _
s-4	■	☐	☐	☐	_ _ _
s-5	☐	☐	■	☐	_ _ _
s-6	■	☐	☐	☐	_ _ _

Assignment 1

Hospital Corps; Orientation; Anatomy and Physiology

Textbook Assignment: Pages i through 3-44

LEARNING OBJECTIVE: Upon completing item 1-1, the learner will be able to identify (in writing) the reason for studying this Rate Training Manual (RTM) and completing the Nonresident Career Course (NRCC).

1-1. The purpose of studying this RTM and completing the NRCC is to
   1. become competent in each of the 42 HM occupations
   2. help fulfill the requirements of the HM rating
   3. meet all the advancement requirements for HM2
   4. fulfill all the above criteria

LEARNING OBJECTIVE: Upon completing items 1-2 thru 1-4, the learner will be able to identify (in writing) professional characteristics required for good patient care.

1-2. In a patient care environment, you can help put your patients at ease by
   1. giving courteous, efficient, and conscientious service
   2. respecting their right to privacy
   3. reflecting their worth and dignity as human beings
   4. all of the above

1-3. As part of the patient care team, you should
   1. carry out the doctors' and nurses' orders and give proper nursing care to patients
   2. assume overall responsibility for patient welfare
   3. assume overall responsibility for meeting the nursing needs of the patients
   4. take the place of absent doctors or nurses

1-4. Personal integrity is demonstrated by
   1. ensuring strict accountability for all controlled substances
   2. refraining from spreading gossip
   3. living up to one's promises
   4. all of the above

LEARNING OBJECTIVE: Upon completing item 1-5, the learner will be able to identify (in writing) principles of good personal finance.

1-5. Principles of personal finance that you should follow include all of the following EXCEPT
   1. living within your means
   2. avoiding financial dealings with patients
   3. making credit card purchases in excess of your ability to pay
   4. paying your bills on time

LEARNING OBJECTIVE: Upon completing item 1-6, the learner will be able to identify (in writing) the basis of naval leadership.

1-6. Naval leadership is based on all of the following EXCEPT
1. social connections
2. a good example
3. moral responsibility
4. managerial ability

LEARNING OBJECTIVE: Upon completing items 1-7 thru 1-11, the learner will be able to identify (in writing) procedures and requirements for advancement within the Navy.

1-7. To qualify for advancement you must do all of the following EXCEPT
1. meet minimum time-in-service requirements
2. complete mandatory NRCCs
3. perform the practical requirements for the next pay grade
4. be recommended by your commanding officer

1-8. Personnel advanced to E-4, E-5, or E-6 are
1. all of those who passed the advancement exam
2. those with the highest final multiple scores
3. all of those with good performance evaluations
4. the most senior qualified candidates

1-9. To prepare for advancement you will need to be familiar with applicable RTMs and
1. NAVPERS 18068
2. NAVPERS 1414/4 HM
3. NAVEDTRA 10052
4. all of the above

1-10. Before you can take the Navywide advancement exam, your supervisor must date and initial each of the naval and occupational standards listed on the PAR form for
1. your previous rate
2. your current rate
3. the next higher rate
4. all of the above

1-11. An HM3 can get a list of required and recommended study materials and courses for advancement to HM2 from
1. NAVPERS 18068
2. NAVPERS 1414/4 HM
3. NAVEDTRA 10052
4. NAVEDTRA 10056

LEARNING OBJECTIVE: Upon completing item 1-12, the learner will be able to identify (in writing) methods of earning credit for mandatory Navy training courses.

1-12. Enlisted personnel may earn credit for a mandatory Navy training course by all of the following methods EXCEPT
1. completing an appropriate Navy school
2. passing locally prepared tests based on the training course
3. being recommended by their immediate superiors
4. passing NRCCs based on the training course

LEARNING OBJECTIVE: Upon completing item 1-13, the learner will be able to identify (in writing) steps to follow when studying Navy training courses.

1-13. When studying Navy training courses, you should follow each of the following steps EXCEPT
1. reading each chapter in detail
2. studying sections related to your job and skimming the rest
3. making a written outline or taking notes on unit material
4. listing questions you have about each unit

LEARNING OBJECTIVE: Upon completing item 1-14, the learner will be able to identify (in writing) the person ultimately responsible for the medical and technical health care guidance issued to the Navy Medical Department.

1-14. Who is ultimately responsible for the medical and technical health care guidance issued to the Navy Medical Department?
1. Surgeon General of the United States
2. Assistant Secretary of Defense for Health Care
3. Secretary of the Navy
4. Chief, Bureau of Medicine and Surgery

LEARNING OBJECTIVE: Upon completing item 1-15, the learner will be able to identify (in writing) the procedure for computing the authorized strength of the Navy Medical Corps.

1-15. The authorized number of Medical Corps officers is _______ of one percent of that part of the total membership of the Navy and Marine Corps population used by the Secretary of the Navy for making the annual computation.
1. sixty-five one-hundredths
2. sixty-five one-thousandths
3. two one-hundredths
4. two one-thousandths

LEARNING OBJECTIVE: Upon completing item 1-16, the learner will be able to identify (in writing) the year the Hospital Corps came into existence.

1-16. Hospital corpsmen have a proud heritage dating back to
1. 1774
2. 1860
3. 1898
4. 1949

LEARNING OBJECTIVE: Upon completing items 1-17 and 1-18, the learner will be able to identify (in writing) terms used in anatomical reference.

1-17. When the body is in the anatomical position, the thumbs point
1. anteriorly
2. posteriorly
3. medially
4. laterally

1-18. The sternum is in what anatomical relation to the spine?
1. Proximal
2. Distal
3. Posterior
4. Anterior

LEARNING OBJECTIVE: Upon completing items 1-19 and 1-20, the learner will be able to identify (in writing) terms associated with the use of food by the body.

1-19. The physical and chemical breakdown of the food we eat is called
1. digestion
2. metabolism
3. anabolism
4. catabolism

1-20. The absorption, storage, and use of digested food substances for body growth, maintenance, and repair is called
1. digestion
2. metabolism
3. anabolism
4. catabolism

LEARNING OBJECTIVE: Upon completing items 1-21 and 1-22, the learner will be able to identify (in writing) characteristics of body tissue.

1-21. The chief functions of _______ tissue are the secretion of digestive fluids and the absorption of digested foods and fluids.
1. cuboidal
2. columnar
3. squamous
4. serous

1-22. If infection is allowed to spread, it can reach virtually every area of the body by moving through _______ tissue.
1. areolar
2. adipose
3. fibrous
4. osseous

LEARNING OBJECTIVE: Upon completing item 1-23, the learner will be able to identify (in writing) the source of red blood cells.

1-23. A decreased red blood cell (RBC) count could be the result of a medical condition affecting
1. yellow marrow
2. red marrow
3. compact bone
4. articulating bone

LEARNING OBJECTIVE: Upon completing items 1-24 thru 1-28, the learner will be able to identify (in writing) facts concerning the human skeletal system.

1-24. The lower jaw is classified as a/an _______ bone.
1. long
2. short
3. flat
4. irregular

1-25. The lower two ribs on either side are called _______ ribs.
1. false
2. floating
3. true
4. sternal

1-26. A fracture of the humerus is most likely located at the
1. head
2. glenoid
3. lesser tuberosity
4. surgical neck

1-27. The innominate bone is composed of three parts that are united in adults to form a cuplike structure called the
1. symphysis pubis
2. obturator foramen
3. acetabulum
4. greater trochanter

1-28. The prominence easily felt on the inner aspect of the ankle is called the
1. medial malleolus
2. lateral malleolus
3. medial condyle
4. lateral condyle

LEARNING OBJECTIVE: Upon completing item 1-29, the learner will be able to identify (in writing) the injury that may occur if the ligaments around a freely movable joint are torn.

1-29. Torn ligaments surrounding a freely movable joint increase the possibility of
1. fracture
2. dislocation
3. compression
4. fatigue

LEARNING OBJECTIVE: Upon completing item 1-30, the learner will be able to identify (in writing) terms that apply to body movements.

1-30. Moving an extremity away from the body is called
1. flexion
2. extension
3. abduction
4. adduction

LEARNING OBJECTIVE: Upon completing items 1-31 thru 1-35, the learner will be able to identify (in writing) facts relating to muscles.

1-31. The ability of a muscle to become shorter or thicker is known as
1. tonicity
2. extensibility
3. contractility
4. elasticity

1-32. A poorly conditioned person who runs in a marathon
1. is not taking a significant risk if the day is cool
2. will be okay if stretching exercises were performed earlier that day
3. can overcome the deficiency with a carbohydrate-rich diet before the race
4. risks muscle damage

1-33. A clue that goose bumps of the skin are caused by smooth muscle contractions is that erection of the papillae occurs
1. involuntarily
2. voluntarily
3. whenever the body is fatigued
4. with pulselike rhythm

1-34. Intramuscular injections are frequently given into the _______ muscle.
1. trapezius
2. pectoralis major
3. deltoid
4. biceps brachii

1-35. Massive intramuscular injections are usually given into the _______ muscle.
1. quadriceps
2. gluteus maximus
3. sartorius
4. gracilis

LEARNING OBJECTIVE: Upon completing items 1-36 thru 1-44, the learner will be able to identify (in writing) correct information concerning the body's circulatory system.

1-36. The transfer of fluids through the plasma membrane from an area of lower concentration of particles to an area of higher concentration is known as
1. perfusion
2. infusion
3. supersaturation
4. osmosis

1-37. Blood of the average man contains _______ million RBCs per _______.
1. 5, mm^3
2. 7, cm^3
3. 7, low power field
4. 5, high-dry field

1-38. A white blood cell (WBC) count of 18,000 indicates
1. normality
2. leukopenia
3. infection
4. none of the above

1-39. If an accident victim suffers from fibrinogen deficiency, the rescuer may have a difficult time
1. stopping blood loss
2. immobilizing a fracture
3. supporting respiration
4. reducing a dislocation

1-40. When a blood vessel is injured, the blood normally clots at the site to prevent excessive blood loss. In addition, the clot
1. converts fibrinogen into blood serum to aid healing
2. forms the foundation for new tissue growth
3. manufactures leukocytes to help fight infection
4. changes damaged tissue into a scar

1-41. Deoxygenated blood is carried by what artery?
1. Carotid
2. Pulmonary
3. Aorta
4. None of the above

1-42. The contraction phase of the heart is called
1. diastole
2. contractile
3. active
4. systole

1-43. Digested materials are absorbed into the _______ venous system.
1. pulmonary
2. systemic
3. portal
4. abdominal

1-44. Most IV infusions and injections are performed on the superficial median cubital vein located at the
1. elbow
2. ankle
3. thigh
4. neck

LEARNING OBJECTIVE: Upon completing item 1-45, the learner will be able to identify (in writing) a major role of the body's lymphatic system.

1-45. The lymphatic system plays a major role in the body's
1. immunity functions
2. nerve impulse transmission
3. carbohydrate metabolism
4. arterial circulation

LEARNING OBJECTIVE: Upon completing items 1-46 and 1-47, the learner will be able to identify (in writing) parts of the upper respiratory system.

1-46. Windpipe is another name for the
1. pharynx
2. larynx
3. trachea
4. oropharynx

1-47. What is the primary muscle of respiration?
1. Mediastinum
2. Diaphragm
3. Intercostal
4. Pleura

LEARNING OBJECTIVE: Upon completing item 1-48, the learner will be able to identify (in writing) the term applied to cessation of breathing.

1-48. Cessation of breathing is known as
1. dyspnea
2. eupnea
3. hypopnea
4. apnea

LEARNING OBJECTIVE: Upon completing items 1-49 thru 1-61, the learner will be able to identify (in writing) facts pertaining to the body's nervous system.

1-49. The nerve cell is also called a/an
1. neuron
2. axon
3. cyton
4. dendrite

1-50. The single, thin extension of the nerve cell outward fron the cyton is the
1. sheath of Schwann
2. ganglion
3. axon
4. dendrite

1-51. The space through which a nerve impulse passes from one neuron to another is called a
1. synapse
2. cyton
3. dendrite
4. ganglion

1-52. The higher mental processes such as reasoning and memory are functions of the
1. cerebellum
2. cerebrum
3. pons
4. medulla oblongata

1-53. The control of respiration and circulation is centered in the
1. cerebellum
2. cerebrum
3. pons
4. medulla oblongata

1-54. Cerebrospinal fluid is produced in the
1. meninges covering the brain
2. ventricles of the brain
3. spinal cord
4. cranial nerves

1-55. The spinal and cranial nerves form the _______ nervous system.
1. peripheral
2. central
3. sensory segment of the autonomic
4. motor segment of the central

In answering items 1-56 thru 1-58, select from column B the function that corresponds to the cranial motor nerve in column A. Items from column B may be used only once.

A. Cranial Motor Nerves

1-56. Hypoglossal

1-57. Abducens

1-58. Accessory

B. Functions

1. Innervates the sternocleidomastoid and trapezius muscles of the neck

2. Controls the muscles of the tongue

3. Controls the muscle that rotates the eye outward

1-59. The intertwined voluntary and involuntary nerves grouped in the neck are called the
1. cauda equina
2. brachial plexus
3. cervical plexus
4. thoracolumbar system

1-60. The two main divisions of the autonomic nervous system are the
1. cerebrum and cerebellum
2. sympathetic and parasympathetic systems
3. voluntary and involuntary systems
4. cranial and sacral systems

1-61. During an emergency the body undergoes changes that facilitate strenuous mental and physical activity. These changes are stimulated by nerve impulses from the
1. sympathetic nervous system
2. voluntary nervous system
3. ganglia in the medulla oblongata
4. ganglia in the midbrain

LEARNING OBJECTIVE: Upon completing items 1-62 thru 1-66, the learner will be able to identify (in writing) the parts of the human eye and their functions.

1-62. The outer protective layer of the eyeball is the
1. retina
2. choroid
3. sclera
4. lens

1-63. The primary source of nourishment to the inner structures of the eyeball is the
1. cornea
2. conjunctiva
3. iris
4. choroid

1-64. The amount of light entering the eye is controlled by the
1. cornea
2. iris
3. retina
4. sclera

1-65. The cavity of the interior eye posterior to the lens is filled with a substance called the
1. ciliary body
2. crystalline body
3. aqueous humor
4. vitreous humor

1-66. Seeing in the dark is made possible by
1. rods
2. cones
3. iris
4. choroid

LEARNING OBJECTIVE: Upon completing items 1-67 thru 1-69, the learner will be able to identify (in writing) facts pertaining to the human ear.

1-67. Sound waves are transmitted from the tympanic membrane to the inner ear through the
1. semicircular canals
2. ossicles
3. bony labyrinth
4. auricle

1-68. A middle ear infection is most likely the result of pathogen penetration through the
1. eustachian tube
2. eardrum
3. fenestra ovalis
4. cerumen

1-69. After entering the ear, sound waves are changed into mechanical vibrations, which, in turn, are converted into nerve impulses by the hair cells of the
1. fenestra rotunda
2. fenestra ovalis
3. endolymph
4. organ of Corti

LEARNING OBJECTIVE: Upon completing item 1-70, the learner will be able to identify (in writing) the stimulus perceived by the sensory receptors in the deepest tissues of the human body.

1-70. Sensory receptors in the deepest tissues of the human body are stimulated only by
1. pressure
2. pain
3. heat
4. cold

LEARNING OBJECTIVE: Upon completing item 1-71, the learner will be able to identify (in writing) the probable reason some people habitually eat midnight snacks.

1-71. A habitual midnight snack eater probably
1. has a genuine feeling of hunger
2. needs the extra nutrition to sustain life
3. suffers from a physiological disorder
4. is a glutton

LEARNING OBJECTIVE: Upon completing items 1-72 thru 2-1, the learner will be able to identify (in writing) facts pertaining to the human endocrine system.

1-72. A patient exhibits a fast pulse rate, dizziness, profuse sweating, and loss of weight despite a tremendous appetite. Which of the following glandular malfunctions may cause the described symptoms?
1. Insufficient secretion of cortical steroids
2. Excessive secretion of thyroxin
3. Insufficient secretion of thyroxin
4. Excessive secretion of the antidiuretic hormone

1-73. A lack of the parathyroid hormone in the human body may cause
1. dwarfism
2. giantism
3. tetany
4. acromegaly

1-74. The hormone that maintains the electrolyte balance is produced by the
1. posterior lobe of the pituitary
2. cortex of each adrenal gland
3. isthmus of the thyroid gland
4. medulla of each adrenal gland

1-75. What glandular secretion increases heart rate?
1. Adrenalin
2. Insulin
3. Oxytocin
4. Vasopressin

Assignment 2

Anatomy and Physiology (continued); First Aid and Emergency Procedures

Textbook Assignment: Pages 3-45 through 4-62

2-1. A medical condition that decreases the productivity of beta cells in the islands of Langerhans could cause
1. glucagon deficiency
2. a type of diabetes
3. low blood sugar levels
4. increased tissue use of glucose

LEARNING OBJECTIVE: Upon completing items 2-2 thru 2-4, the learner will be able to identify (in writing) facts pertaining to the human digestive system.

2-2. A restaurant patron is choking on food. The most likely spot where the food is lodged, impeding the airway, is the
1. mouth
2. epiglottis
3. esophagus
4. cardiac sphincter

2-3. The mesentery serves which of the following purposes?
1. Suspending the small intestine
2. Secreting a lubricating fluid
3. Providing a pathway for blood vessels to the abdominal organs
4. All of the above

2-4. Most of the absorption of food occurs in the
1. duodenum
2. jejunum
3. ileum
4. cecum

LEARNING OBJECTIVE: Upon completing items 2-5 and 2-6, the learner will be able to identify (in writing) facts pertaining to the human accessory organs of digestion.

2-5. Insulin is secreted by the
1. pancreas
2. liver
3. gallbladder
4. stomach

2-6. Bile is stored in the
1. pancreas
2. liver
3. gallbladder
4. stomach

LEARNING OBJECTIVE: Upon completing items 2-7 and 2-8, the learner will be able to identify (in writing) facts pertaining to the human urinary system.

2-7. The functions of the kidneys include
1. maintaining normal pH of the blood
2. removing nitrogenous waste products
3. removing excess sugar
4. all of the above

2-8. Failure of the kidneys to remove waste products from the blood often results in
1. glomerulonephritis
2. uremia
3. diabetes insipidus
4. diabetes mellitus

LEARNING OBJECTIVE: Upon completing items 2-9 thru 2-11, the learner will be able to identify (in writing) facts pertaining to the human reproductive systems.

2-9. Optimal temperature in the testes is maintained primarily by
1. sweat evaporation
2. blood engorgement
3. scrotal muscles
4. fat insulation

2-10. The hormones estrogen and progesterone are manufactured by
1. the uterus
2. the ovaries
3. the fallopian tubes
4. none of the above

2-11. Fertilization of an ovum normally takes place in the
1. vagina
2. ovaries
3. uterus
4. fallopian tubes

LEARNING OBJECTIVE: Upon completing item 2-12, the learner will be able to identify (in writing) purposes for first aid.

2-12. First aid is the action taken to
1. treat casualties until definitive care is available
2. prevent further injury
3. preserve vitality and resistance to disease
4. all of the above

LEARNING OBJECTIVE: Upon completing items 2-13 and 2-14, the learner will be able to identify (in writing) two general first-aid rules.

2-13. When giving first aid to a casualty, treat the most _______ condition first.
1. obvious
2. life-threatening
3. painful
4. swollen and infected

2-14. When, if ever, is it acceptable to touch an open wound with the fingers?
1. Only when it is absolutely necessary to stop bleeding
2. To remove a protruding foreign body
3. To replace bulging abdominal organs
4. Never

LEARNING OBJECTIVE: Upon completing items 2-15 and 2-16, the learner will be able to identify (in writing) two procedures used in evaluating the condition of a casualty.

2-15. Evaluation of a patient's diagnostic and vital signs includes all of the following EXCEPT the
1. description of breathing sounds
2. presence or absence of perspiration on the skin
3. strength of the pulse
4. type of stimulus and reaction

2-16. When examining a patient with a medical problem, auscultate for all of the following EXCEPT
1. tracheal air flow
2. abnormal bowel sounds
3. brachial pulse
4. harsh, high-pitched respiratory sounds

LEARNING OBJECTIVE: Upon completing item 2-17, the learner will be able to identify (in writing) items found in a Unit One bag.

2-17. Which of the following items are normally found in a Unit One bag?
1. Ophthalmic solutions
2. Band-Aids
3. Minor surgical instrument sets
4. All of the above

LEARNING OBJECTIVE: Upon completing items 2-18 thru 2-20, the learner will be able to identify (in writing) the groups into which casualties are placed upon arrival at a BAS.

Casualties arriving at a BAS are grouped according to the types of injuries and treatments required. In items 2-18 thru 2-20, select from column B the group in which you should place each injury in column A. Items from column B may be used only once.

	A. Injuries	B. Groups
2-18.	Severely lacerated leg and hemorrhage controlled by a tourniquet	1. 1
		2. 2
2-19.	Superficial cuts requiring debridement	3. 3
		4. 4
2-20.	Fatigue and mild dehydration	

LEARNING OBJECTIVE: Upon completing items 2-21 thru 2-24, the learner will be able to identify (in writing) the procedures for diagnosing and treating airway obstruction.

2-21. One of the most reliable indications of a completely blocked airway in a conscious person is
1. partially chewed food in the mouth
2. a terrified expression
3. the inability to speak
4. cherry-colored skin or nail beds

2-22. If a neck injury is suspected, use the _______ method to open a partially obstructed airway.
1. abdominal thrust
2. backslap
3. head tilt
4. jaw tilt

2-23. In cases of complete airway obstruction, the first treatment procedure is to give four backslaps
1. as quickly as possible
2. in rhythm with the victim's coughing attempts
3. between the kidneys
4. gently to avoid fracturing ribs

2-24. If backslaps fail to relieve the airway obstruction, try four quick abdominal thrusts
1. after checking vital signs
2. only if the victim can be placed in a standing or sitting position
3. with hands positioned slightly superior to the umbilicus
4. and wait for a physician

LEARNING OBJECTIVE: Upon completing items 2-25 thru 2-29, the learner will be able to identify (in writing) the procedures to be used in artificial ventilation.

2-25. After ventilating a patient at the rate of one ventilation every 5 seconds for 1 minute, you check the patient's pupils and find them dilated. This probably indicates that
1. ventilations are insufficient; check for obstruction and correct the technique
2. ventilations are adequate; continue until breathing is spontaneous
3. the patient is suffering from drug overdose
4. the patient is going into shock

2-26. How would you give artificial ventilation to a patient with a badly fractured mandible?
1. With an oxygen mask
2. By the back-pressure arm-lift method
3. By mouth-to-mouth ventilation
4. By mouth-to-nose ventilation

2-27. When relieving gastric distention during artificial ventilation, what problem should you anticipate?
1. Gas
2. Vomiting
3. Internal bleeding
4. Cardiac arrest

2-28. In mouth-to-mouth ventilation, the patient is receiving air with an oxygen (O_2) level already depleted by the rescuer's carbon dioxide. If circulatory deficiency also exists, the amount of O_2 absorbed into the victim's blood will not be sufficient to sustain life for prolonged periods. The hypoxia can be countered by the use of the
1. bag-valve-mask system
2. mouth-to-nose ventilation method
3. oropharyngeal airway
4. nasopharyngeal airway

2-29. To form an airtight seal over an infant's face when using the mouth-to-mask system,
1. fit the apex of the mask over the chin
2. fit the apex of the mask over the bridge of the nose
3. fit an infant-sized mask over the baby's face
4. compress the collar of the standard issue adult mask

LEARNING OBJECTIVE: Upon completing item 2-30, the learner will be able to identify (in writing) the reason for limiting the period of continuous suction.

2-30. Do not continuously suction a patient for more than 15 seconds because
1. the equipment will clog or malfunction
2. suctioning deprives the patient of oxygen
3. prolonged suction increases secretion
4. prolonged suction damages the pharyngeal lining

2-31. The _______ artery is the best place to find the pulse of an unconscious person.
1. radial
2. carotid
3. apical
4. femoral

LEARNING OBJECTIVE: Upon completing item 2-32, the learner will be able to identify (in writing) the organ most likely to be damaged by a xiphoid fractured during CPR.

2-32. A xiphoid fractured during CPR is most likely to damage the
1. spleen
2. kidneys
3. liver
4. lungs

LEARNING OBJECTIVE: Upon completing items 2-33 thru 2-36, the learner will be able to identify (in writing) the correct CPR procedures.

2-33. When performing cardiac compression on an adult, depress the sternum _______ inches.
1. 1.0 to 1.5
2. 1.0 to 2.0
3. 1.5 to 2.0
4. 1.5 to 2.5

2-34. When one rescuer performs CPR, the compression to ventilation ratio is
1. 5 to 1
2. 1 to 5
3. 15 to 2
4. 2 to 15

2-35. When two rescuers perform CPR, the compression to ventilation ratio is
1. 1 to 5
2. 5 to 1
3. 15 to 2
4. 2 to 15

2-36. When performing CPR on children, use the heel of one hand to depress the sternum _______ inches.
1. 0.5 to 0.75
2. 0.75 to 1.5
3. 1.5 to 2.0
4. 2.0 to 2.5

LEARNING OBJECTIVE: Upon completing item 2-37, the learner will be able to identify (in writing) the origin of dark red blood that flows at a steady, even rate.

2-37. Blood that is dark red and flowing at a steady, even rate is usually
1. capillary
2. venous
3. arterial
4. from the pulmonary artery

LEARNING OBJECTIVE: Upon completing items 2-38 and 2-39, the learner will be able to identify (in writing) the most effective techniques for controlling hemorrhage.

2-38. The most effective technique for controlling hemorrhage, and the one that should be used first, is
1. direct pressure
2. pressure at the pressure points
3. elevation
4. splinting

2-39. If direct pressure fails to stop the bleeding in 10 to 15 minutes, the next step is usually to
1. apply another compress
2. apply a tourniquet
3. use pressure points
4. lower the wound below heart level

LEARNING OBJECTIVE: Upon completing items 2-40 thru 2-43, the learner will be able to identify (in writing) the proper considerations in applying bandages.

2-40. Roller bandage application to a limb should be
1. firm but not too tight
2. checked regularly to see if the limb is swelling
3. even, leaving no gaps where the skin can be pinched
4. all of the above

2-41. When possible, the initial turns of a roller bandage should be made
1. proximal to the compress
2. directly over the compress
3. around the narrowest part of the limb
4. around the thickest part of the limb

2-42. The Barton bandage is used to hold a compress to the
1. foot
2. arm
3. neck
4. chin

2-43. If a compress or dressing becomes soaked and bleeding continues,
1. cover it with another compress or dressing
2. remove it and put a dry one in its place
3. immediately apply a tourniquet
4. examine the casualty immediately

LEARNING OBJECTIVE: Upon completing item 2-44, the learner will be able to identify (in writing) the definition of a pressure point.

2-44. What is a pressure point?
1. A point where the blood pressure drops low enough to stop bleeding
2. A place where an artery is protected on all sides by bone and muscle
3. A place where an artery is close to the skin surface and over a bone
4. A point where an artery is near the wound

LEARNING OBJECTIVE: Upon completing items 2-45 thru 2-49, the learner will be able to identify (in writing) the location of specific pressure points.

2-45. The pressure point located in a notch on the lower edge of the mandible is used to stop bleeding
1. from the neck
2. in the region of the temple or the scalp
3. on the face below the level of the eyes
4. from the eyes

2-46. To control bleeding of the shoulder or upper arm, apply digital pressure to the
1. area just in back of the prominent neck muscle
2. area just in front of the prominent neck muscle
3. back of the clavicle
4. front of the clavicle

2-47. Apply digital pressure on the inner side of the arm, about halfway between the shoulder and the elbow, to stop bleeding from the
1. elbow
2. forearm
3. wrist
4. hand

2-48. Bleeding from the hand usually is controlled by pressure applied on the
1. inside of the elbow
2. middle of the lower arm
3. middle of the upper arm
4. wrist

2-49. Pressure applied to the back of the knee controls bleeding
1. at the ankle
2. between the knee and the foot
3. in the ankle or the foot
4. between the knee and the trunk

LEARNING OBJECTIVE: Upon completing item 2-50, the learner will be able to identify (in writing) factual statements about pressure points.

2-50. Which of the following information about pressure points is incorrect?
1. Pressure is applied to the pressure point that is closest to the wound, and between the wound and the trunk.
2. Use of pressure points works best in conjunction with direct pressure.
3. Use of pressure points and elevation can slow hemorrhage until direct pressure or a tourniquet can be applied.
4. Use of pressure points is ideal when hemorrhage must be controlled for an extended time.

LEARNING OBJECTIVE: Upon completing item 2-51, the learner will be able to identify (in writing) the proper care of a patient with a tourniquet.

2-51. If a tourniquet is used to stop bleeding, you must
1. place the affected limb lower than the heart
2. mark a large "T" on the victim's forehead and log the time
3. loosen it every 30 minutes until definitive care is given
4. wrap the affected limb in a sheet or blanket

LEARNING OBJECTIVE: Upon completing item 2-52, the learner will be able to identify (in writing) a proper step in treating an animal bite wound.

2-52. All animal bite wounds should be
1. considered group 1 injuries in a triage situation
2. sutured after cleansing to prevent infection
3. covered with antiseptic spray or ointment
4. carefully cleansed with soap and water

LEARNING OBJECTIVE: Upon completing items 2-53 thru 2-55, the learner will be able to identify (in writing) facts related to infections.

2-53. Wound infection is often the result of
1. carelessness
2. vitamin C deficiency
3. an aseptic technique
4. contusion-type injuries

2-54. The principal symptoms of inflammation are
1. redness, edema, heat, and pain
2. paleness, pus, and painless edema
3. edema, paleness, cold, and pain
4. pain, pus, paleness, and swelling

2-55. The term "furuncle" refers to an abscess in the
1. muscular tissue
2. true skin
3. lymph nodes
4. nose

LEARNING OBJECTIVE: Upon completing item 2-56, the learner will be able to identify (in writing) the correct procedures for treating a protruding abdominal injury.

2-56. First-aid treatment for a protruding abdominal injury includes all of the following EXCEPT

1. covering the intestine with a dry sterile dressing
2. placing the victim on his or her back with the knees drawn up or flat
3. starting an IV if indicated
4. getting the victim to a physician as soon as possible

LEARNING OBJECTIVE: Upon completing item 2-57, the learner will be able to identify (in writing) the correct procedure for removing an embedded fishhook.

2-57. What procedure should be used for removing a fishhook that is embedded in the tissue of a patient?

1. Push the hook through the skin and clip off the exposed barb.
2. Encourage bleeding to lubricate the passage.
3. Make an incision down to the hook.
4. Manipulate the hook gently backward and forward to enlarge the opening.

LEARNING OBJECTIVE: Upon completing item 2-58, the learner will be able to identify (in writing) an absorbable suture material.

2-58. Which of the following suture materials is absorbable?

1. Nylon
2. Catgut
3. Linen
4. Silk

LEARNING OBJECTIVE: Upon completing item 2-59, the learner will be able to identify (in writing) the suturing technique that produces the best cosmetic effect.

2-59. When suturing, the best cosmetic results are obtained from numerous interrupted sutures placed _______ inch apart with the point of insertion _______ inch from the wound edge.

1. one-fourth, one-fourth
2. one-fourth, one-eighth
3. one-eighth, one-fourth
4. one-eighth, one-eighth

LEARNING OBJECTIVE: Upon completing items 2-60 thru 2-63, the learner will be able to identify (in writing) facts concerning recognition and treatment of shock.

2-60. Which of the following are signs of shock?

1. Skin hot and dry, pupils dilated, and pulse rapid and weak
2. Skin hot and dry, pupils constricted, pulse slow and strong
3. Skin cool and clammy, pupils dilated, and pulse rapid and weak
4. Skin moist and clammy, pupils constricted, and pulse slow and strong

2-61. A satisfactory electrolyte solution for oral administration to a shock victim can be made by adding _______ to 1 liter of water.

1. 1.0 tsp sugar + 0.5 tsp baking powder
2. 0.5 tsp sugar + 1.0 tsp baking powder
3. 1.0 tsp salt + 0.5 tsp baking soda
4. 0.5 tsp salt + 1.0 tsp baking soda

2-62. Treatment of shock includes all of the following EXCEPT

1. establishing or maintaining an open airway
2. placing the victim in a supine position with the feet slightly raised
3. covering the victim with a blanket to maintain core temperature
4. giving alcohol to conscious patients as a systemic stimulant

2-63. Morphine is contraindicated for casualties with head injuries because it
1. increases intracranial pressure
2. dilates the pupils
3. stimulates respirations
4. produces memory defects

LEARNING OBJECTIVE: Upon completing items 2-64 and 2-65, the learner will be able to identify (in writing) considerations concerning the administration of morphine.

2-64. Which of the following doses of morphine may be given to an adult in severe pain when other pain-relieving drugs are not available and there are no contraindications?
1. 16 mg followed by 8 mg 4 hours later
2. 16 mg followed by 16 mg 4 hours later
3. 32 mg followed by 16 mg 8 hours later
4. 32 mg followed by 32 mg 8 hours later

2-65. To indicate to all personnel in the evacuation chain that a person has received a morphine injection, attach the used Syrette to the shirt collar and write _______ and the time of injection on the patient's _______.
1. "T", forehead
2. "M", back
3. "M", forehead
4. "T", back

LEARNING OBJECTIVE: Upon completing items 2-66 thru 3-1, the learner will be able to identify (in writing) the proper procedures for caring for patients with fractures.

2-66. The main reason for immobilizing a fracture is to
1. prevent further injury
2. eliminate pain and swelling
3. decrease blood circulation
4. increase blood circulation

2-67. To fit well and provide adequate immobilization to an injured part, a splint must be
1. strong, rigid, and applied tightly
2. extended 3 inches above and below a fracture
3. twice the width of the limb
4. well-padded at body contact areas

2-68. What should be done if the victim's fingers become blue or cold following the application of an arm splint?
1. Vigorously massage the hand.
2. Loosen the fastenings on the splint.
3. Elevate the affected arm.
4. Warm the hand with a hot water bottle.

2-69. What is the first-aid treatment for a fracture at or near the elbow?
1. Place a pad or folded towel in the armpit, bandage the arm securely to the body, and support the forearm with a sling.
2. Place a splint on the outside of the arm from shoulder to elbow, fasten the arm to the body, and support the forearm with a sling.
3. Fasten two splints inside and outside of the upper arm and support the forearm with a sling.
4. Carefully splint the arm in whatever position you find it.

2-70. What is the correct way to splint a fractured thigh?
1. After straightening the leg, apply one splint from the armpit to the foot and another from the crotch to the foot.
2. After straightening the leg, apply two splints of equal length, extending from the hip to the ankle.
3. After straightening the leg, apply two or four splints, depending on the location of the fracture.
4. Using two supports, splint the leg in the position in which you find it.

2-71. A fractured patella is immobilized with a padded splint, at least 4 inches wide, extending from the heel to the buttock. Extra padding must be placed under the _______ and just above the _______.
1. buttock, calf
2. thigh, calf
3. ankle, calf
4. knee, heel

2-72. First-aid treatment for a fractured rib consists of
1. immobilizing the arm on the injured side with a swathe
2. strapping the ribs with adhesive tape while the lungs are expanded
3. administering oxygen and encouraging deep breathing
4. taking X-rays of the fracture and evacuating the victim

2-73. What is the most important consideration in caring for a victim with a fractured jaw?
1. Applying an immobilization bandage immediately
2. Resetting the jaw as soon as possible
3. Salvaging as many teeth as possible
4. Ensuring an open airway and adequate breathing

2-74. First aid for a suspected skull fracture includes all of the following EXCEPT
1. applying direct pressure for hemorrhage control
2. removing impaled objects as gently as possible
3. maintaining normal body temperature
4. keeping the victim reassured and lying down

2-75. Before transporting a victim with a suspected spinal fracture, secure the victim to a/an
1. flexible backboard, and secure the head with a forehead strap
2. Army litter, and secure the head with a forehead strap
3. flexible backboard, and bracket the head with pillows
4. rigid backboard

Assignment 3

First Aid and Emergency Procedures (continued); Patient Care

Textbook Assignment: Pages 4-62 through 5-6

3-1. To immobilize a victim with a suspected pelvic fracture, do all of the following EXCEPT
1. gently place the victim in a supine position
2. check to see if the victim is more comfortable with the legs straight or bent
3. place a pillow between the victim's thighs
4. use a strong blanket or tarpaulin to transport the victim

LEARNING OBJECTIVE: Upon completing item 3-2, the learner will be able to identify (in writing) the body parts usually involved in dislocations, sprains, strains, and contusions.

3-2. Dislocations, sprains, strains, and contusions are usually injuries to the
1. joints and muscles
2. blood vessels and ligaments
3. joints and nerves
4. bones and blood vessels

LEARNING OBJECTIVE: Upon completing items 3-3 thru 3-5, the learner will be able to identify (in writing) facts related to dislocations.

3-3. The most frequently dislocated joints are the
1. knee, ankle, elbow, and neck
2. knee, hip, elbow, and jaw
3. shoulder, hip, finger, and jaw
4. shoulder, ankle, finger, and neck

3-4. Symptoms of a dislocation include all of the following EXCEPT
1. deformity between the joints
2. swelling and discoloration at the joint
3. stiffness and pain at the joint
4. numbness and decreased circulation below the joint

3-5. When reducing a dislocated jaw, do all of the following EXCEPT
1. wrapping your thumbs
2. positioning your thumbs behind the last lower molars
3. lifting the chin up with your fingers
4. opening the victim's mouth several times to ensure complete reduction

LEARNING OBJECTIVE: Upon completing items 3-6 thru 3-12, the learner will be able to identify (in writing) the correct procedures for handling victims of poisoning.

3-6. When taking the history of a suspected poisoning victim, it is essential to collect all of the following information EXCEPT
1. name of the ingested poison
2. time of ingestion
3. quantity of poison
4. manufacturer of the poison

3-7. Which of the following would you call first for advice regarding a suspected case of poisoning?

1. Emergency room of the nearest military facility
2. Public Health Service
3. Local Poison Control Center
4. Nearest private physician

3-8. If you decide to induce vomiting, which of the following is the method of choice?

1. Give the victim 2 teaspoonfuls of activated charcoal.
2. Give the victim 3 teaspoonfuls of syrup of ipecac.
3. Tickle the back of the victim's throat.
4. Give the victim warm soapy water.

3-9. Strong acid poisoning is managed by _______ and starting an IV infusion of dextrose and water.

1. inducing emesis
2. administering steroids and antibiotics
3. diluting and neutralizing the acid with citrus drinks or vinegar in water
4. diluting and neutralizing the acid with milk and milk of magnesia or antacids

3-10. Strong alkali poisoning is managed by _______ and starting an IV infusion of dextrose and water.

1. inducing emesis
2. administering steroids and antibodies
3. diluting and neutralizing the alkali with lemon or orange juice or vinegar and water
4. diluting and neutralizing the alkali with milk and milk of magnesia

3-11. If a physician or poison control center cannot be reached, your treatment of a patient who has ingested a petroleum product may be limited to taking vital signs, requesting evacuation, and administering

1. an emetic
2. vegetable oil
3. citrus juices
4. dairy products

3-12. After removing a victim of inhalation poisoning from the contaminated atmosphere, do all of the following EXCEPT

1. administering 100% oxygen
2. treating for shock
3. administering warm, stimulating drinks
4. transporting the victim to a medical facility

LEARNING OBJECTIVE: Upon completing item 3-13, the learner will be able to identify (in writing) the proper treatment for a severe anaphylactic reaction to an insect bite.

3-13. Treatment for a severe anaphylactic reaction to an insect bite includes starting an IV infusion and all of the following EXCEPT

1. removing constricting jewelry
2. removing the stinger
3. injecting epinephrine
4. relieving discomfort with calamine lotion

LEARNING OBJECTIVE: Upon completing items 3-14 thru 3-19, the learner will be able to identify (in writing) facts concerning poisonous snakes, spiders, and jellyfish, and their bites.

3-14. A patient who has recently used an outside latrine comes to sick call exhibiting symptoms of black widow spider bite but is not aware of having been bitten. Your examination should concentrate on the

1. buttocks and genitalia
2. head and neck
3. upper torso
4. extremities

3-15. The brown recluse spider is identified by a mark shaped like a/an

1. hourglass
2. rectangle
3. square
4. violin

3-16. The coral snake looks very similar to numerous types of nonpoisonous banded snakes. Its key identifying feature is the
1. yellow band touching the red band
2. black band touching the red band
3. distinctive chewing motion
4. short front teeth

3-17. Symptoms of a pit viper bite include bradycardia or tachycardia, shock, and all of the following EXCEPT
1. pain with edema and swelling
2. nausea and vomiting
3. hypertension
4. headache

3-18. When giving first aid for a snake bite, place a
1. tourniquet distal to the bite site
2. tourniquet proximal to the bite site
3. constricting band distal to the swelling
4. constricting band proximal to the swelling

3-19. When treating a jellyfish sting, neutralize the nematocysts with
1. sea water
2. ice
3. sand
4. vinegar

LEARNING OBJECTIVES: Upon completing items 3-20 and 3-21, the learner will be able to identify (in writing) true statements concerning drug abuse.

3-20. Signs and symptoms of barbiturate abuse include all of the following EXCEPT
1. apnea
2. slurred speech
3. staggering
4. faulty judgment

3-21. Marijuana is a _______ drug.
1. harmless
2. mild hallucinogenic
3. strong hallucinogenic
4. physically addictive

LEARNING OBJECTIVE: Upon completing items 3-22 thru 3-27, the learner will be able to identify (in writing) symptoms and treatments of various types of burns.

3-22. A burn victim exhibiting symptoms of blistering and reddening of the skin on the chest, abdomen, and right arm is described as having _______ degree burns covering _______% of the body.
1. first, 18
2. second, 18
3. first and second, 27
4. second and third, 36

3-23. Before transporting a victim of extensive or serious scalding, you should _______ and administer analgesics.
1. apply anesthetic ointment to the burns, cover them with clean bandages,
2. apply bacitracin liberally to the burns, cover them with elastic bandages,
3. start an IV electrolyte solution, cover the burns with sterile dressings,
4. wash the affected parts with distilled water, leave the burns uncovered,

3-24. While examining a patient who has been in direct contact with a 220 volt power line, you find evidence of small burns where the current entered and left the victim's body. The victim
1. will be okay since the wound areas are small
2. may suffer severe pain but will recover
3. may have suffered extensive internal damage
4. is in little danger of cardiac arrest if the heart is still beating

3-25. What two types of chemical burns are normally not flushed with water?
1. Dry lime and phenol
2. White phosphorus and lye
3. Phenol and acids
4. Lye and alkalis

3-26. Neutralize alkali burns with a diluted _______ solution.
1. alcohol
2. phenol
3. baking soda
4. vinegar

3-27. What first-aid method should be attempted immediately for burning white phosphorus particles partially embedded in a victim's skin?
1. Flush the area with saline while rushing the victim to sickbay.
2. Flush the area with water while attempting superficial debridement.
3. Cut off oxygen to the surface area by wrapping it with petroleum-impregnated dressings.
4. Cover your mouth and nose with a moist cloth while mixing a solution of copper sulfate.

LEARNING OBJECTIVE: Upon completing items 3-28 thru 3-35, the learner will be able to identify (in writing) methods of preventing and treating heat- and cold-related injuries.

3-28. In case of severe heat cramps, how can you hydrate the victim to reverse a slide into heat exhaustion?
1. Give Compazine by mouth and wait until the nausea subsides.
2. Place a salt tablet under the tongue.
3. Give the victim cool, salty water to drink.
4. Cool the victim with water and wait until the nausea subsides.

3-29. First-aid treatment of heat stroke must immediately focus on
1. reducing body temperature
2. restoring water and salt loss
3. preventing seizure and coma
4. preventing shock

3-30. In a shipboard or field situation, you can minimize the danger of heat exposure by
1. monitoring the WBGT
2. educating NCOs and officers to the use of the PHEL chart
3. eliminating unnecessary heat sources when possible
4. doing all of the above

3-31. During field operations, which of the following is the most readily available first-aid method for treating a victim of hypothermia?
1. Engine exhausts
2. Rewarming tubs
3. Buddy warming
4. Artificial heat

3-32. Proper first aid for a patient suffering from immersion foot includes removing wet shoes and socks, keeping the victim warm, and
1. gently massaging the affected areas with an emollient
2. keeping the affected areas uncovered in a warm, dry environment
3. keeping the affected areas covered with fluff bandages at all times
4. spraying unbroken blisters with an antiseptic

3-33. For which of the following reasons should a frostbitten area be allowed to stay frozen?
1. Until a diagnosis is confirmed
2. If there is any possibility of refreezing
3. To minimize the severity of pain
4. To prevent shock

3-34. The best method of rewarming a frozen extremity is by
1. using skin-to-skin buddy warming
2. immersing it in 38° to 41° C water
3. using an electric blanket
4. immersing it in 106° to 110° F water

3-35. After a frozen extremity is rewarmed, follow-up care includes all of the following EXCEPT
1. patting the limb dry
2. immersing the limb in a warm whirlpool bath
3. forcing fluids and monitoring food intake
4. gently rubbing the limb with an antiseptic emollient cream

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LEARNING OBJECTIVE: Upon completing item 3-36, the learner will be able to identify (in writing) the position most helpful to a person who feels faint.

3-36. What position is most helpful to a person who feels faint?
1. Sitting upright in a chair
2. Lying supine with the head and shoulders raised
3. Lying in the reverse shock position
4. Lying with the head and shoulders lower than the rest of the body

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LEARNING OBJECTIVE: Upon completing item 3-37, the learner will be able to identify (in writing) the quickest and easiest way to determine if an unconscious person is a diabetic.

3-37. What is the quickest and easiest way to determine if an unconscious person is a diabetic?
1. Check for a Medic Alert tag, bracelet, or card.
2. Look for signs or symptoms of acidosis.
3. Check the breath for an alcohol odor.
4. Look for cherry-colored lips.

LEARNING OBJECTIVE: Upon completing items 3-38 thru 3-42, the learner will be able to identify (in writing) first-aid measures for certain diseases and conditions.

3-38. First aid for a stroke victim should include all of the following EXCEPT
1. placing the victim in a semireclining position
2. keeping mental track of the vital signs and symptoms to pass them to the physician
3. administering oxygen if indicated
4. calming family members and reassuring the victim

3-39. First aid for angina pectoris victims consists of giving a nitroglycerin tablet (if in their possession), reassuring them, and
1. starting CPR immediately
2. massaging the back and chest muscles
3. giving cool, isotonic beverages
4. encouraging them to rest

3-40. First aid for a myocardial infarction victim who is not suffering cardiopulmonary arrest includes all of the following EXCEPT
1. giving oxygen
2. monitoring vital signs
3. starting an IV infusion of normal saline
4. rapidly transporting the victim to a medical facility

3-41. First aid for an epileptic seizure patient consists of
1. starting CPR immediately
2. protecting the victim from further injury
3. loosening clothing and applying cold packs to plexus areas
4. applying muscle massage during stages of rigidity

3-42. What should you do when a victim brought aboard after 30 minutes in the icy water has a body temperature of 90° F and has no pulse or respiration?
1. Notify the CO of the victim's death.
2. Give a precordial thump and four quick breaths; discontinue if there is no response.
3. Immediately start CPR while crewmembers begin rewarming.
4. Immediately start rewarming and begin CPR in sickbay.

LEARNING OBJECTIVE: Upon completing items 3-43 thru 3-46, the learner will be able to identify (in writing) certain procedures to be used during delivery of a fetus.

3-43. When childbirth or spontaneous abortion is imminent, the best thing an HM can do is
1. act professionally and keep the mother reassured
2. monitor the mother's vital signs and call them in every 5 minutes
3. encourage the mother to take short, quick breaths during contractions to ease pain
4. make an urgent call to the nearest hospital for help

3-44. Place your hands on the emerging baby's head and apply gentle pressure to
1. prevent an explosive delivery
2. keep the umbilical cord from squeezing the baby's neck
3. give the placenta time to separate
4. promote self-breathing by the infant

3-45. When should the infant be suctioned?
1. If it does not breathe spontaneously after birth
2. After its buttocks have been slapped
3. Once it has completely emerged
4. When the chin first emerges

3-46. In a prolapsed cord delivery, get a physician's assistance as quickly as possible and
1. gently pull the baby out as far as possible
2. attempt to keep the cord from being compressed by inserting a hand into the vagina
3. tell the woman about the problem and inherent dangers
4. sever the cord as soon as it presents

LEARNING OBJECTIVE: Upon completing items 3-47 thru 3-58, the learner will be able to identify (in writing) certain facts about rescue and associated equipment.

3-47. The OBA is valuable in rescue operations because it
1. filters dust, mist, and vapors from the atmosphere
2. provides positive pressure ventilation for the rescuer
3. provides negative pressure ventilation for the rescuer
4. is self-contained

3-48. Connecting an air line mask to an oxygen source could result in
1. carbon monoxide poisoning
2. carbon dioxide poisoning
3. an oil contact explosion
4. a friction-contact explosion

3-49. Against which of the following do gas masks offer effective protection?
1. Chemical agents
2. Carbon monoxide
3. Carbon dioxide
4. Industrial gases

3-50. An asbestos suit protects the wearer during a
1. brief exposure to flames
2. prolonged exposure to steam
3. brief exposure to toxic gases
4. prolonged exposure to heat

3-51. To haul an unconscious person up from a flooding compartment, attach a lifeline around the
1. hips or below the groin
2. chest and under the arms
3. waist and to the belt
4. wrists and ankles

3-52. How should you extinguish fire in a person's clothing if nothing is available to smother the flames?
1. Lie on the victim and cover him or her with your body.
2. Loosen the victim's clothing and roll him or her over rapidly.
3. Remove the victim's clothing and throw dirt on him or her.
4. Roll the victim over slowly and beat out the flames with your hands.

3-53. What immediate action should you take to protect a victim in a steam-filled compartment if the only exit is blocked by escaping steam?
1. Move the victim to the highest point in the compartment.
2. Move the victim to the lowest level in the compartment.
3. Cover the victim's mouth and nose with a wet cloth.
4. Clothe the victim in an asbestos suit.

3-54. Which of the following methods should you use to rescue a drowning person if you have had no special training in lifesaving techniques?
1. Swim out to help the victim to safety.
2. Shout encouragement.
3. Phone, signal, or call for help.
4. Extend a line or pole and pull the victim to safety.

3-55. A short spineboard is of most use
1. as a supplemental back support in a Stokes' stretcher
2. in vertical rescues
3. in extricating a driver slumped over the steering wheel of a wrecked car
4. as a sliding surface in difficult extrications

3-56. The tied-hands crawl is used to transport an unconscious person who
1. is seriously injured
2. is too heavy to be lifted
3. must be dragged for a long distance
4. must be dragged under a low structure

3-57. If you are using a blanket drag to transport an injured person, move the casualty by pulling him or her on the
1. back, feet first
2. back, head first
3. uninjured side, feet first
4. uninjured side, head first

3-58. What is the advantage of the chair carry?
1. Ease of transporting heavy persons
2. Ease of transporting persons downstairs
3. Safety in transporting persons with pelvic injuries
4. Safety in transporting persons with neck injuries

LEARNING OBJECTIVE: Upon completing item 3-59, the learner will be able to identify (in writing) basic differences between health and illness.

3-59. The concept of health includes
1. the absence of disease or disability
2. a feeling of well-being
3. soundness of mind, spirit, and body
4. both 1 and 3 above

LEARNING OBJECTIVE: Upon completing item 3-60, the learner will be able to identify (in writing) the members of the health care team.

3-60. The patient is a member of the health care team.
1. True
2. False

LEARNING OBJECTIVE: Upon completing item 3-61, the learner will be able to identify (in writing) the agency that developed standards that address rights and responsibilities of patients and whose goals are compatible with the goals of the Navy Medical Department.

3-61. The agency that developed standards that address both rights and responsibilities of patients and whose goals are compatible with the goals of the Navy Medical Department is the
1. Joint Commission on Accreditation of Hospitals (JCAH)
2. National League for Nursing (NLN)
3. American Hospital Association (AHA)
4. American Medical Association (AMA)

LEARNING OBJECTIVE: Upon completing items 3-62 thru 3-69, the learner will be able to identify (in writing) implications of professional ethics and interpersonal relations in providing health care services.

3-62. Ethics refers to a set of rules or a body of principles. Each professional group establishes a body of principles or standards of conduct that provide guidance for its members. The Code of the US Fighting Forces is such a code. It sets forth standards
1. of general behavior for members of the Armed Forces
2. for military grooming
3. for military courtesy
4. for the behavior of enlisted persons toward officers

3-63. All members of the Hospital Corps pledge themselves to a code of behavior called the
1. International Code of Medical Ethics
2. Hippocratic Oath
3. Hospital Corpsman Pledge
4. Florence Nightingale Pledge

3-64. The establishment of professional relationships between the health care staff and patients is
1. an asset in providing optimal care
2. considered fraternization in the Navy
3. required only of nurses and doctors
4. not necessary in providing optimal care

In items 3-65 thru 3-67, select from column B the descriptive statement that best reflects the concept of the term listed in column A. Items in column B may be used only once.

	A. Terms	B. Descriptive Statements
3-65.	Culture	1. Process of people relating to each other
3-66.	Interpersonal relations	2. Distinction based on physical characteristics rather than those socially learned
3-67.	Race	3. Socially learned shared standards and behavior patterns

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3-68. If a person professing to be an atheist is placed on the Very Serious List (VSL), which of the following actions by the hospital corpsman would be considered unethical?
1. Discussing the patient's beliefs with the patient upon request
2. Informing the duty chaplain of the patient's critical classification
3. Informing the entire ward staff of the patient's condition and religious convictions
4. Aggressively attempting to convince the patient to embrace some religious belief

3-69. Why is the hospital corpsman's action unethical in the above situation?
1. The chaplain is informed of a patient's deteriorating condition only if the patient requests it.
2. By telling the entire ward staff, the corpsman is violating the patient's right to confidentiality.
3. By attempting to force religious beliefs on a patient, the hospital corpsman is interfering with the individual's freedom of choice.
4. Hospital corpsmen should never discuss religion with patients.

LEARNING OBJECTIVE: Upon completing items 3-70 thru 3-74, the learner will be able to identify (in writing) components and principles of communication.

3-70. Communication takes place only through conversation.
1. True
2. False

3-71. In the communication process, feedback is the response given by the receiver, which always confirms that the message sent was received and understood.
1. True
2. False

3-72. Barriers in provider-patient communication commonly result from the presence of all of the following EXCEPT
1. technical language
2. political differences
3. ethnic background
4. hearing problems

3-73. What type of communication barrier is the most difficult to identify and the most common source of communication breakdown?
1. Spiritual
2. Physical
3. Physiological
4. Psychosocial

3-74. One of the many skills a health care provider uses to assist the patient is listening. Which of the following does NOT enhance that skill?
1. Concentrating
2. Maintaining objectivity
3. Hearing the speaker out
4. Anticipating phrases and meaning

LEARNING OBJECTIVE: Upon completing item 3-75, the learner will be able to identify (in writing) the differences between contact point and therapeutic communication.

Based on the text discussion of contact point and therapeutic communication, in item 3-75 select from column B the term that best fits the situational event in column A.

	A. Events		B. Terms
3-75.	Providing directions to a patient on how to reach the medical clinic	1.	Contact point
		2.	Therapeutic communication

Assignment 4

Patient Care (continued); Clinical Laboratory

Textbook Assignment: Pages 5-7 through 6-13

Based on the text discussion of contact point and therapeutic communication, in items 4-1 and 4-2 select from column B the term that best fits the situational event in column A. Items in column B may be used more than once.

	A. Events	B. Terms
4-1.	Giving instruction to a recently diagnosed diabetic inpatient	1. Contact point
4-2.	Servicing consumers at the outpatient records room	2. Therapeutic communication

4-3. All of the following are purposes of therapeutic communication EXCEPT
1. collecting information to determine the nature of a patient's illness
2. assessing and modifying, if appropriate, a patient's behavior
3. providing health education
4. inhibiting the physical and emotional well-being of patients

LEARNING OBJECTIVE: Upon completing items 4-4 thru 4-11, the learner will be able to identify (in writing) the elements of assessing and reporting as they impact on the implementation and evaluation of a patient's treatment.

4-4. The medical treatment for an inpatient at an NRMC is prescribed by the
1. clinical coordinator
2. physician's assistant
3. independent duty hospital corpsman
4. medical officer

In items 4-5 thru 4-9, select from column B the kind of observation that applies to the situation described in column A. Items in column B may be used more than once.

	A. Situations	B. Kinds of Observation
4-5.	While you are on night duty, an elderly patient tells you, "I just fell out of bed."	1. Subjective
		2. Objective
4-6.	While checking pedal pulses, you notice that one leg is warmer than the other.	
4-7.	While admitting a patient to your medical ward, you notice the patient grimacing and reaching for his or her stomach.	
4-8.	During morning rounds a patient complains of being awake all night.	
4-9.	As you pick up a patient's dinner tray, you notice that only the liquids on the tray have been consumed.	

4-10. The primary purpose of the patient's clinical record is to provide
1. medicolegal documentation for court cases
2. statistical data for Federal research
3. clinical resources for training medical personnel
4. a chronological record of patient care and response to medical treatment

4-11. Which of the following elements about a patient's chest pain should you document in the clinical record?
1. Quality
2. Severity
3. Location
4. All of the above

LEARNING OBJECTIVE: Upon completing items 4-12 and 4-13, the learner will be able to identify (in writing) the responsibilities unique to health care providers.

4-12. Patient education in the hospital environment is the responsibility of
1. the physician and nurse only
2. the nursing education coordinator
3. the commanding officer's advisory board
4. all members of the health care team

4-13. In providing a health care service, accountability means
1. the providers are held answerable for their actions based on their education, training, and experience
2. the providers must continue to grow by acquiring new knowledge and skills
3. the providers are bound by a code of health care ethics and are expected to function according to the standards of that code
4. all of the above

LEARNING OBJECTIVE: Upon completing items 4-14 thru 4-18, the learner will be able to identify (in writing) the value of safety requirements and measures in a health care environment.

4-14. Side rails are placed on the bed of an elderly patient primarily
1. to be used as hand holds to facilitate the patient's independence in movement
2. as a precautionary measure since many patients in this age group become disoriented
3. because hospital regulations require them
4. because the patient will rest better with the security of knowing they are there

4-15. The plug on the portable lamp in the examining room has become loose, causing the light to spark and flicker, and the physician angrily complains to you about it. What should you do?
1. Examine the lamp to determine the reason for malfunction and then repair it.
2. Pass on the details of the incident at the change of shift report.
3. Tag the defective lamp, remove it from the examining room, and ensure that it is sent for repair.
4. Listen politely to the physician's complaint, but take no action since the problem is the responsibility of medical repair.

4-16. Ice bags can cause skin contact burns.
1. True
2. False

4-17. Who is responsible for enforcing no-smoking regulations in a health care facility?
1. The station fire department
2. Hospital security personnel
3. All staff personnel
4. The director of administrative services

4-18. The purpose of documenting accidents and incidents that occur in a health care facility is to
1. protect the hospital and staff from being sued by the patient
2. have notations to use when writing performance evaluations on the staff
3. identify problem areas so corrective action can be taken
4. ensure that the responsible person is identified and punished

4-19. Attention to environmental hygiene includes maintaining unit cleanliness and
1. limiting disturbing noises
2. eliminating disagreeable odors
3. controlling annoying light
4. all of the above

LEARNING OBJECTIVE: Upon completing items 4-20 thru 4-31, the learner will be able to identify (in writing) methods of controlling the spread of pathogenic organisms in the hospital environment.

Information for items 4-20 thru 4-23:

An intern excises a carbuncle on the back of the neck of a patient before changing an abdominal dressing on the same patient. A few days later the patient develops a staphylococcal infection in the abdominal wound, and the surgeon orders the institution of the Wound and Skin Precautions isolation technique.

Based on the above information, select from column B the situational element that matches the probable chain of infection link listed in column A. Items in column B should be used only once.

	A. Chain of Infection Link	B. Situational Element
4-20.	Mode of transmission	1. The patient's carbuncle
4-21.	Reservoir of infection	2. The abdominal wound site
4-22.	Portal of entry	
4-23.	Susceptible host	3. The intern's contaminated hands
		4. The patient

4-24. Washing hands before changing a patient's dressing and between caring for different patients is an essential practice of medical asepsis.
1. True
2. False

4-25. The method of choice for sterilizing most surgical instruments is
1. boiling
2. steam under pressure
3. gas
4. soaking in glutaraldehyde

4-26. What critical step must be observed when using ethylene oxide gas for sterilization?
1. Provide for an adequate aeration period.
2. Ensure proper steam and temperature penetration.
3. Exhaust all steam before opening the loading door.
4. Provide all operators with safety goggles and masks.

4-27. Surgical stainless steel suture is often provided by the manufacturer in an unsterile package.
1. True
2. False

Information for items 4-28 and 4-29:

Although not an operating room technician, you have been assigned to work in the OR for a month before transferring to a shipboard assignment.

4-28. While assisting the circulator in opening sterile supplies and putting them on the sterile field, you think you touched the field with the corner of a wrapper. After you tell the scrub corpsman about this, what should he or she do?
1. Ask the circulator if he or she saw the area you contaminated.
2. Nothing, since that area of the field is probably not considered sterile.
3. Tell the circulator that a new setup is needed to replace the contaminated one.
4. Advise you not to open any more supplies until you improve your technique.

4-29. While collecting sterile gear for the next day's procedure, you notice that a package of sterile towels is outdated. What should you do?
1. Put the package back into the sterile supply cabinet.
2. Use the package for the procedure since only the outside is contaminated.
3. Ensure that the package is unwrapped, inspected, and, if usable, rewrapped for sterilization.
4. Resterilize the package without unwrapping it.

4-30. The purpose of the surgical hand scrub is to
1. reduce resident and transient skin bacteria on the hands and forearms to a minimum
2. remove all bacteria from an individual's hands and forearms
3. remove all pathogenic organisms from an individual's hands and forearms
4. remove obvious dirt from the hands and forearms

4-31. The friction created in performing the surgical scrub contributes to the
1. removal of transient bacteria attached to the skin
2. antiseptic action of the detergent on resident bacteria
3. bactericidal effect on all pathogenic bacteria
4. chemical sterilization on the hands and arms

LEARNING OBJECTIVE: Upon completing item 4-32, the learner will be able to identify (in writing) wearing apparel specifications to ensure a safe operating room environment.

4-32. Because of its nonstatic qualities, which material is most acceptable for use in OR clothing and linens?
1. Synthetic
2. Untreated synthetic blend
3. 100% cotton
4. Wool

LEARNING OBJECTIVE: Upon completing items 4-33 thru 4-41, the learner will be able to identify (in writing) the role of nutritive substances in both health and illness.

For items 4-33 thru 4-38, select from column B the nutritive substance that applies to the functional statement in column A. Items in column B may be used more than once.

	A. Functional Statement	B. Nutritive Substance
4-33.	Stored in the liver as glycogen	1. Fats
		2. Carbohydrates
4-34.	Carriers for fat-soluble vitamins	3. Proteins
4-35.	Required for tissue building	4. Vitamins
4-36.	Vital for converting nutritive substances into energy	
4-37.	The most efficient source of energy	
4-38.	The most concentrated source of energy	

4-39. Which of the following is the medium in which all chemical reactions in the body take place?
1. Water
2. Blood
3. Vitamins
4. Minerals

4-40. Which of the following basic food groups is a major source of protein nutrients?
1. Grain
2. Meat
3. Milk
4. Vegetable/fruit

4-41. Almost all of the body's vitamin C requirements are available in which of the following food groups?

1. Grain
2. Meat
3. Milk
4. Vegetable/fruit

LEARNING OBJECTIVE: Upon completing items 4-42 thru 4-44, the learner will be able to identify (in writing) aspects that characterize and influence the care and treatment of medical patients.

4-42. The general plan of treatment of a medical patient does NOT usually involve

1. drug therapy
2. food and fluid therapy
3. diagnostic tests and procedures
4. surgical aseptic technique

4-43. If a patient admitted to your ward 3 days ago with a diagnosis of abdominal pain, etiology unknown, has been up all night with diarrhea, the physician will probably order

1. measurement of vital signs q.h.
2. measurement of fluid I&O
3. strict bed rest
4. low salt diet

4-44. The primary reason rest is prescribed for a medical patient is to

1. prevent further damage to a stressed body part or system
2. reduce the incidence of circulatory problems
3. minimize cross contamination and subsequent spread of pathogens
4. encourage a feeling of well-being in the patient

LEARNING OBJECTIVE: Upon completing items 4-45 thru 4-52, the learner will be able to identify (in writing) aspects that characterize and influence the treatment and care of surgical patients.

4-45. When a patient is admitted to the hospital for a major surgical procedure, the health care provider can expect that the patient will

1. exhibit anxiety and fear
2. be demanding
3. exhibit passive behavior
4. be very cooperative

4-46. How can the health care provider assist in reducing patients' preoperative anxiety?

1. Telling them there is nothing to worry about
2. Refraining from discussing any aspect of the procedure with them
3. Encouraging them to talk about their feelings
4. Arranging for a psychiatrist or psychologist to visit them

4-47. A regional anesthetic affects a patient's

1. entire body
2. level of consciousness
3. motor, but not sensory, perception
4. specific body area

4-48. Following the administration of spinal anesthesia, incorrect positioning may cause

1. paralysis of the respiratory muscles
2. development of pressure areas over bony prominences
3. fractures resulting from dangling anesthetized extremities
4. contact burns on improperly grounded patients

4-49. During what stage of general anesthesia is the patient's sense of hearing increased?

1. Danger
2. Operative
3. Excitement
4. Analgesia

4-50. Dropping a metal basin on the floor of the operating room as the patient reaches stage 2 of general anesthesia will probably cause

1. an explosion in the room
2. the patient to react violently
3. the patient to wake up
4. no reaction from the patient

4-51. Frequent observation of a patient's skin color is an important aspect of recovery room care because

1. all patients undergoing general anesthesia will become somewhat pale
2. such changes are significant signs of the patient's ability to recover from the anesthetic agent
3. subtle change in skin color may indicate the development of respiratory difficulties, postoperative bleeding, or impending shock
4. it is part of standard recovery care orders

4-52. In addition to respiratory function and cardiovascular status, which of the following is improved by early movement and ambulation of postoperative patients (when permitted)?

1. Renal function
2. Nutritional status
3. Elimination function
4. All of the above

LEARNING OBJECTIVE: Upon completing item 4-53, the learner will be able to identify (in writing) common problems that sometimes result from long-term immobilization of an orthopedic patient.

4-53. When caring for a 19-year-old orthopedic patient requiring long-term immobilization, the health care provider should anticipate the development of all of the following EXCEPT

1. skin breakdown
2. symptoms of emotional stress
3. frequent episodes of disorientation
4. episodes of aching pain

LEARNING OBJECTIVE: Upon completing items 4-54 thru 4-56, the learner will be able to identify (in writing) the behavioral responses commonly observed in dying patients.

4-54. A terminally ill patient says to you, "If I could just get something to take away my pain for a few days, I might be able to eat more and get some strength back." In reference to the stages of dying identified by Dr. Kuebler-Ross, the patient is going through the stage of

1. anger
2. acceptance
3. bargaining
4. depression

4-55. The dying patient may exhibit all of the following behavioral reactions EXCEPT

1. resentment
2. euphoria
3. resignation
4. depression

4-56. Once the terminally ill patient has reached the acceptance stage of dying, the patient care plan should place emphasis on

1. support of all family members
2. increased diversional activities
3. nutritional adequacy
4. encouraging participation in religious activities

LEARNING OBJECTIVE: Upon completing item 4-57, the learner will be able to identify (in writing) the reason for wiping away the first drop of blood when performing a finger puncture.

4-57. When performing a finger puncture, wipe away the first drop of blood to avoid

1. contamination with bacteria
2. clotting at the puncture site
3. dilution with tissue fluid
4. dilution with alcohol

LEARNING OBJECTIVE: Upon completing item 4-58, the learner will be able to identify (in writing) the type of blood vessel that should be compressed by the tourniquet applied during venipuncture.

4-58. A tourniquet applied to the arm during venipuncture should provide enough tension to compress the vein but not the artery.
1. True
2. False

LEARNING OBJECTIVE: Upon completing items 4-59 and 4-60, the learner will be able to identify (in writing) certain parts of the microscope and their purposes.

4-59. The part of the microscope on which it rests is called the
1. frame
2. arm
3. base
4. stage

4-60. What objective should be used for detailed study of stained bacterial smears?
1. Low-power
2. High-dry
3. Oil-immersion
4. Either 2 or 3 above

LEARNING OBJECTIVE: Upon completing item 4-61, the learner will be able to identify (in writing) components of a CBC.

4-61. The CBC includes which of the following determinations?
1. Total WBC count
2. Differential WBC count
3. Hemoglobin
4. All of the above

LEARNING OBJECTIVE: Upon completing items 4-62 thru 4-68, the learner will be able to identify (in writing) pertinent facts concerning the RBC count.

4-62. A subnormal RBC count may indicate that the patient has
1. leukopenia
2. anemia
3. leukemia
4. uremia

4-63. When drawing blood for an RBC count, fill the pipette to the _______ mark.
1. 0.05
2. 0.5
3. 11.0
4. 101.0

4-64. Which procedure(s) is/are important in the use of the pipette so that a good blood specimen may be obtained for an RBC count?
1. The pipette should be held in a nearly horizontal position while filling so that the exact height of the blood column can be seen.
2. The curve of the tip of the pipette may rest against the skin, but the orifice must be free.
3. The orifice of the pipette must be kept immersed in the blood to prevent air bubbles from being drawn in.
4. All of the above procedures are important.

4-65. If too much blood is drawn into the pipette during the RBC count, withdraw the excess by touching the tip of the pipette to
1. a gauze pad
2. a cotton ball
3. the skin
4. a metal surface

4-66. Which of the following conditions indicates that the counting chamber is properly loaded?
1. There is a thin, even film of fluid under the coverglass.
2. The fluid flows into the grooves at the edges of the chamber.
3. Air bubbles are seen in the field.
4. The chamber is flooded.

4-67. What objective should be used for counting RBCs?
1. Low-power
2. High-power
3. High-dry
4. Oil-immersion

4-68. To arrive at the number of RBCs per mm^3 of blood, total the number of cells counted in all five fields and multiply by
1. 5
2. 50
3. 10,000
4. 50,000

LEARNING OBJECTIVE: Upon completing item 4-69, the learner will be able to identify (in writing) the time interval between the transfer of blood to the Sahli tube and the reading of results in the Sahli-Hellige method of hemoglobin estimation.

4-69. In the Sahli-Hellige method of hemoglobin estimation, how long after the blood has been transferred to the Sahli tube may the results be read on the graduated tube?
1. 5 minutes
2. 20 minutes
3. 1 hour
4. 2 hours

LEARNING OBJECTIVE: Upon completing item 4-70, the learner will be able to identify (in writing) the term used for the volume of erythrocytes expressed as a percentage of the volume of whole blood in a sample.

4-70. What is the term used for the volume of erythrocytes expressed as a percentage of the volume of whole blood in a sample?
1. Hematocrit
2. Hemoglobin
3. Red blood count
4. Complete blood count

LEARNING OBJECTIVE: Upon completing item 4-71, the learner will be able to identify (in writing) the cause of dyscrasia of blood-forming tissues.

4-71. Dyscrasia of blood-forming tissue is caused by
1. bacteria
2. mosquito bites
3. tularemia
4. malfunction of the marrow and lymph tissues

LEARNING OBJECTIVE: Upon completing items 4-72 thru 5-3, the learner will be able to identify (in writing) pertinent facts concerning the WBC and differential counts.

4-72. What is the term used to describe an abnormally low WBC count?
1. Leukocytosis
2. Erythrocytosis
3. Leukopenia
4. Pancytopenia

4-73. All of the following are proper steps in obtaining a WBC count EXCEPT
1. drawing blood to the 0.5 mark in the pipette that has the white mixing pellet
2. drawing diluting fluid to the 11.0 mark
3. shaking the pipette on its long axis for 3 minutes
4. loading the counting chamber by touching the tip of the pipette against the edge of the coverglass and the surface of the counting chamber

4-74. The rule for counting cells stipulates that you count all the cells including those touching the border lines at the
1. top and on the right
2. top and on the left
3. bottom and on the right
4. bottom and on the left

4-75. To arrive at the number of white cells per mm^3 of blood, total the number of cells counted in the four fields and multiply by
1. 0.5
2. 5.0
3. 50
4. 5,000

Assignment 5

Clinical Laboratory (continued); Pharmacology and Toxicology

Textbook Assignment: Pages 6-13 through 7-30

5-1. A differential blood count is a count of the percentage distribution of

1. lymphocytes
2. monocytes
3. leukocytes
4. erythrocytes

5-2. The term used to describe an abnormally high WBC count is

1. leukocytosis
2. erythrocytosis
3. leukopenia
4. pancytopenia

5-3. A continued shift to the left with a falling total WBC count indicates

1. progress toward normal recovery
2. a decrease in immature neutrophils
3. a breakdown of the body's defense mechanism and is a poor prognosis
4. a decrease in parasitic and allergenic conditions

LEARNING OBJECTIVE: Upon completing items 5-4 thru 5-10, the learner will be able to identify (in writing) facts and procedures concerning blood smears for differential counts.

5-4. Wright's stain must be stored in a stopper bottle in a dark place for a minimum of

1. 12 hours
2. 24 hours
3. 20 days
4. 30 days

5-5. All of the techniques listed below are used for making smears EXCEPT

1. holding the second slide between the thumb and forefinger and placing the edge against the top of the slide holding the drop of blood
2. backing the second slide down until it contacts the drop of blood
3. tilting the slide so that the metallic film settles to the surface of the smear and remains there
4. pushing the second slide along the surface of the other slide, drawing the blood across the surface in a thin, even smear

5-6. When staining a smear with Wright's stain, the stain and buffer should be mixed until a _______ film appears.

1. silvery, metallic
2. bluish-gray
3. coppery, metallic
4. greenish-blue

5-7. What is the most common cause of poor results with Wright's stain?

1. Incorrect pH of staining fluid
2. Too much acid
3. Incorrect time intervals
4. Too much buffer

5-8. If a smear used in a differential count is to be saved for reexamination, remove the immersion oil by placing a piece of lens tissue over the slide and moistening the tissue with

1. alcohol
2. water
3. xylol
4. acetone

5-9. When viewing a smear for a differential count, you identify the cells with the large, scattered, dark blue granules that are darker than their nuclei as
1. lymphocytes
2. monocytes
3. basophils
4. neutrophils

5-10. The largest of the normal WBCs is the
1. monocyte
2. lymphocyte
3. eosinophil
4. basophil

LEARNING OBJECTIVE: Upon completing items 5-11 thru 5-15, the learner will be able to identify (in writing) facts concerning urine samples.

5-11. The least valid urine specimen is the _______ specimen.
1. overnight
2. random
3. fasting
4. 24-hour

5-12. What is the action of toluene on a urine specimen?
1. It increases the albumin.
2. It dissolves unwanted cells.
3. It protects the specimen from air.
4. It dissolves the albumin.

5-13. When thymol is used to preserve a urine sample, enough thymol may dissolve to produce false positives for
1. glucose
2. protein
3. ketones
4. albumin

5-14. In the microscopic examination of urine sediment, scan the slide using the low-power objective and examine it in detail using the _______ objective.
1. low-power
2. high-dry
3. high-power
4. oil-immersion

5-15. The addition of one drop of 5% acetic acid to urine sediment will disintegrate
1. white cells
2. mucous threads
3. casts
4. red cells

LEARNING OBJECTIVE: Upon completing item 5-16, the learner will be able to identify (in writing) the substance used as a standard for specific gravity determination.

5-16. The specific gravity of a liquid or solid substance is the weight of the substance as compared to an equal volume of
1. ethanol
2. methanol
3. distilled water
4. normal saline

LEARNING OBJECTIVE: Upon completing item 5-17, the learner will be able to identify (in writing) the disposition of laboratory reports on active duty personnel following transcription.

5-17. After the results of laboratory tests performed on active duty outpatients have been transcribed to the SF 600 in the Health Record, the laboratory report should be
1. destroyed
2. stapled to the SF 514
3. stapled to the SF 518
4. filed with the sick call record

LEARNING OBJECTIVE: Upon completing item 5-18, the learner will be able to identify (in writing) the subsciences of materia medica to which statements concerning the action of drugs and factors used in determining dosage relate.

5-18. To what subsciences of materia medica do the following statements relate?
(A) Coagulants are drugs that hasten the coagulation process of blood. (B) The patient's age is a common factor used in determining the amount of the drug to be given.
1. (A) Pharmacology (B) Pharmacognosy
2. (A) Posology (B) Pharmacology
3. (A) Pharmacology (B) Posology
4. (A) Pharmacognosy (B) Pharmacology

LEARNING OBJECTIVE: Upon completing items 5-19 thru 5-24, the learner will be able to identify (in writing) factors relative to drug dosages.

5-19. The largest amount of a drug that may safely be given to the average patient is termed the _______ dose.
1. lethal
2. usual
3. maximum
4. toxic

5-20. The factor that most commonly influences the amount of drug given a patient is
1. sex
2. weight
3. age
4. route of administration

5-21. If the average adult dose of terpin hydrate elixir is 5 ml, the dose for an 8-year-old child is _______ ml.
1. 1
2. 2
3. 3
4. 4

5-22. If the average adult dose of a drug is 250 mg, the dose for a child weighing 30 pounds is _______ mg.
1. 25
2. 30
3. 50
4. 80

5-23. In computing the amount of drug to be given to an underweight female, what adjustments to the normal dosage would ordinarily be made?
1. Increase of dosage because of her sex and a further increase because of her weight
2. Increase of dosage because of her sex but a decrease because of her weight
3. Decrease of dosage because of her sex and a further decrease because of her weight
4. Decrease of dosage because of her sex but an increase because of her weight

5-24. A drug given repeatedly to a patient often has to be increased in dosage to maintain the desired effect. The need for a larger dose is probably caused by a/an
1. acquired tolerance from habitual use
2. abnormal sensitivity
3. cumulative action from habitual use
4. individual idiosyncrasy

LEARNING OBJECTIVE: Upon completing items 5-25 thru 5-28, the learner will be able to identify (in writing) methods of administering drugs.

5-25. Smallpox vaccinations are administered
1. intramuscularly
2. intradermally
3. subcutaneously
4. orally

5-26. When a prolonged action is desired, what method of parenteral administration is used?
1. Intradermal
2. Intravenous
3. Intramuscular
4. Hypodermoclysis

5-27. The method most commonly used to replace large quantities of fluids lost from the body is
1. intravenous
2. hypodermoclysis
3. oral
4. intradermal

5-28. Inunction is used to administer a/an
1. cathartic
2. expectorant
3. ointment
4. antihistamine

LEARNING OBJECTIVE: Upon completing item 5-29, the learner will be able to identify (in writing) the usual percentage of official diluted acids.

5-29. The uniform strength of official diluted acids is usually _______ %.
1. 8
2. 10
3. 12
4. 20

LEARNING OBJECTIVE: Upon completing items 5-30 thru 5-54, the learner will be able to identify (in writing) drugs, drug groups, and chemicals, as well as their uses, dosages, and methods of administration.

5-30. A superficial infection of the external auditory canal is usually treated with
1. hydrochloric acid
2. acetic acid
3. sodium hypochlorite
4. muriatic acid

5-31. In addition to being an antacid, milk of magnesia may be used as a/an
1. adsorbent
2. astringent
3. demulcent
4. laxative

5-32. Which of the following medications would be used internally to treat lead colic?
1. Calamine
2. Sodium bicarbonate
3. Alum
4. Milk of magnesia

5-33. Aluminum acetate is used in solution as an
1. antacid
2. astringent
3. adsorbent
4. expectorant

5-34. Which of the following emollients is used to protect sensitive skin from excessive exposure to the sun?
1. Lubricating jelly
2. Zinc oxide ointment
3. White petrolatum
4. Theobroma oil

5-35. Drugs that inhibit the growth of microorganisms without necessarily destroying them are
1. germicides
2. antiseptics
3. bacteriostatics
4. parasiticides

5-36. Severe dermatitis may develop from prolonged use of
1. calamine lotion
2. Lassar's paste
3. coal tar ointment
4. aluminum acetate solution

5-37. The disinfectant power of a substance is expressed in its relationship to _______ acid.
1. Carbolic
2. Boric
3. Tannic
4. Sulfuric

5-38. Ingestion of phenol usually results in death from
1. renal failure
2. cardiac arrest
3. respiratory failure
4. shock

5-39. If you accidently spill liquified phenol on your skin, you should immediately rinse the affected part with which neutralizing agent?
1. Creosol
2. Naphthalene
3. Alcohol
4. Water

5-40. Undecylenic acid is used as a/an
1. fungicide
2. analgesic
3. antipyretic
4. disinfectant

5-41. Nystatin is particularly useful in the treatment of
1. anthrax
2. meningitis
3. syphilis
4. moniliasis

5-42. Which of the following drugs may be used to treat scabies?
1. Nystatin
2. Gamma benzene hexachloride
3. Sodium hypochlorite solution
4. Benzalkonium chloride

5-43. The rust-preventive additives in Zephiran chloride solutions used for the sterile storage of metal instruments are the two sodiums
1. nitrite and chloride
2. chloride and salicylate
3. salicylate and bicarbonate
4. bicarbonate and nitrite

5-44. To loosen impacted wax in a patient's ears, the physician may prescribe a solution of
1. sodium hypochlorite
2. silver nitrate
3. hydrogen peroxide
4. cupric sulfate

5-45. A dilute solution of silver nitrate may be used as an
1. emollient and hematinic
2. antipyretic and demulcent
3. antiseptic and astringent
4. adsorbent and stimulant

5-46. Which of the following medications is widely used to treat fungal infections of the feet?
1. Whitfield's ointment
2. Zinc oxide ointment
3. Clotrimazole
4. Formalin

5-47. Which of the following medications is an effective germicidal agent against all forms of microorganisms?
1. Boric acid solution
2. Nitromersol
3. Formaldehyde solution
4. Thimerosal

5-48. The oral dose of nitrofurantoin for urinary tract infections should be continued for at least _______ days.
1. 3
2. 5
3. 7
4. 9

5-49. What drug group is used to soften feces and ease bowel movement?
1. Emetics
2. Digestants
3. Analgesics
4. Cathartics

5-50. Drugs that expel, paralyze, or kill intestinal worms are called
1. amebicides
2. anthelmintics
3. anodynes
4. antipyretics

5-51. The drug used in the emergency treatment of hypertension and pulmonary edema is
1. hydrochlorothiazide
2. chlorthalidone
3. furosemide
4. doxapram

5-52. A medicine that relieves pain without impairing mental capacities or producing unconsciousness is known as a/an
1. analgesic
2. antipyretic
3. hemantinic
4. tranquilizer

5-53. Which of the following drugs is contraindicated for a patient with a peptic ulcer?
1. Aspirin
2. Propoxyphene HCl
3. Furosemide
4. Acetaminophen

5-54. Ritalin, a CNS stimulant, is preferably given
1. with meals
2. 1 hour before meals
3. 30-45 minutes before meals
4. 30 minutes after meals

LEARNING OBJECTIVE: Upon completing item 5-55, the learner will be able to identify (in writing) the chapter of the Manual of the Medical Department (MANMED) that deals with pharmacy operation and drug control.

5-55. What chapter of MANMED deals with pharmacy operation and drug control?
1. 18
2. 20
3. 21
4. 26

LEARNING OBJECTIVE: Upon completing item 5-56, the learner will be able to identify (in writing) the term used to indicate the increased effect produced by the joint action of drugs.

5-56. The effects of an analgesic may be increased by administering the analgesic in combination with a barbiturate. The increased effect produced by the joint action of drugs is known as
1. amensalism
2. commensalism
3. parasitism
4. synergism

LEARNING OBJECTIVE: Upon completing item 5-57, the learner will be able to identify (in writing) the cause of death following an overdose of barbiturates.

5-57. Death from an overdose of barbiturates is caused by _______ failure.
1. respiratory
2. hepatic
3. renal
4. cardiac

LEARNING OBJECTIVE: Upon completing item 5-58, the learner will be able to identify (in writing) a physiologic antidote for barbiturates.

5-58. To counteract the effects of barbiturates, physiologic antidotes may be given, including
1. phenytoin sodium
2. doxapram HCl
3. amobarbital
4. ephedrine

LEARNING OBJECTIVE: Upon completing item 5-59, the learner will be able to identify (in writing) the maximum time interval between opening and using paraldehyde.

5-59. Paraldehyde must not be dispensed if the container has been opened for more than _______ hours.
1. 4
2. 12
3. 16
4. 24

LEARNING OBJECTIVE: Upon completing items 5-60 thru 6-30, the learner will be able to identify (in writing) drugs, drug groups, and vitamins, as well as their actions, uses, and side effects.

5-60. The two most important opium alkaloids are morphine and
1. meperidine
2. paregoric
3. codeine
4. paraldehyde

5-61. The primary use of paregoric is as a/an
1. hypnotic
2. intestinal sedative
3. analgesic
4. respiratory depressant

5-62. In which of the following ways does morphine sulfate differ from codeine sulfate?
1. It is less depressing.
2. It is less constipating.
3. It is more potent.
4. It has more therapeutic uses.

5-63. Chlorpromazine HCl is used mainly to
1. treat motion sickness
2. alleviate symptoms of tension, agitation, and psychosis
3. counteract the effects of alcohol withdrawal
4. relieve respiratory depression

5-64. Tubocurarine chloride in small doses blocks the transmission of nerve impulses to the
1. cardiac muscle
2. skeletal muscles
3. spinal cord
4. autonomic nervous system

5-65. Which of the following drugs is used in orthopedic manipulations such as setting fractures?
1. Morphine
2. Succinylcholine chloride
3. Tubocurarine chloride
4. Succinylsulfathiazole

5-66. The drug of choice for status epilepticus is
1. chlordiazepoxide HCl
2. phenobarbital
3. diazepam
4. phenytoin

5-67. In stimulating and strengthening the heart, digitoxin acts primarily on the
1. heart valves
2. heart muscle
3. blood vessels
4. vagus nerve

5-68. For a patient suffering from an acute attack of asthma, the physician would probably order
1. atropine
2. epinephrine
3. ephedrine
4. Tyzine

5-69. Night blindness is caused by a deficiency in vitamin
1. C
2. B_6
3. E
4. A

5-70. Beriberi may be treated effectively by adding vitamin _______ to the diet.
1. B_{12}
2. D
3. B_1
4. A

5-71. Pellagra is caused by a diet deficient in
1. carotene
2. thiamin
3. riboflavin
4. niacin

5-72. What vitamin is used in combination with isoniazid to decrease the side effects of long-term therapy?
1. B_6
2. B_{12}
3. E
4. K

5-73. What vitamin affects the absorption and use of calcium and phosphorus in the body?
1. A
2. B_{12}
3. D
4. E

5-74. The pharmacological action of sulfonamides is
1. germicidal
2. bacteriostatic
3. parasiticidal
4. bacteriocidal

5-75. What supplemental treatment is recommended for a patient undergoing sulfadiazine therapy?
1. Forced fluids and sodium bicarbonate
2. Forced fluids and magnesium sulfate
3. Tranquilizers and sodium carbonate
4. Tranquilizers and castor oil

Assignment 6

Pharmacology and Toxicology (continued); Pharmacy

Textbook Assignment: Pages 7-30 through 8-14

6-1. Which of the following drugs is especially effective in treating urinary tract infections caused by Proteus microorganisms?
1. Sulfadiazine
2. Sulfisoxazole
3. Succinylsulfathiazole
4. Phthalysulfathiazole

Questions 6-2 thru 6-8 are based on the following list of antibiotics.

A - Penicillin
B - Potassium penicillin G
C - Procaine penicillin G
D - Phenoxymethal penicillin
E - Ampicillin
F - Sodium nafcillin
G - Oxacillin sodium
H - Neomycin sulfate
I - Chloramphenicol
J - Erythromycin
K - Bacitracin
L - Oxytetracycline hydrochloride
M - Benzathine pencillin G

6-2. Drug A is effective in the treatment of all of the following infections EXCEPT
1. anthrax
2. gonococcal infections
3. gas gangrene
4. typhoid

6-3. The penicillin of choice for oral administration is
1. A
2. B
3. D
4. E

6-4. Select the drug that was developed primarily as a staphylococcide.
1. D
2. F
3. H
4. J

6-5. Which drug is used in treatment of Staphylococcus aureus infections?
1. B
2. D
3. F
4. G

6-6. Which of the following conditions is an adverse effect of drug H?
1. Blood dyscrasia
2. Deafness
3. Diarrhea
4. Myasthenia gravis

6-7. Which antibiotic is especially effective against rickettsial diseases?
1. A
2. G
3. I
4. L

6-8. If a patient is hypersensitive to penicillin, which antibiotic would the physician most likely prescribe as a substitute?
1. F
2. I
3. J
4. K

6-9. General anesthetics are usually gas or vapor and are administered by
1. parenteral injection
2. inhalation
3. inunction
4. hypodermoclysis

6-10. The anesthetic agent commonly used in dentistry is
1. cyclopropane
2. halothane
3. nitrous oxide
4. ethylene

6-11. The use of cyclopropane for general anesthesia has which of the following advantages?
1. It is nonexplosive.
2. It is nontoxic.
3. It does not cause respiratory irritation.
4. It does not cause nausea.

6-12. Before suturing a wound on a patient's forearm, you should inject a local anesthetic into the
1. deepest part of the wound
2. sound tissue surrounding the wound
3. surface of the wound
4. lacerated tissue surrounding the wound

6-13. Local anesthetics containing epinephrine should never be injected into the
1. face
2. abdomen
3. forearm
4. toes

6-14. Antidotal treatment for poisoning caused by cocaine hydrochloride includes
1. gastric gavage with dilute tannic acid and intramuscular administration of morphine sulfate
2. gastric lavage and intravenous injections of short-acting barbiturates
3. gastric lavage and oral administration of chlorpromazine hydrochloride
4. parenteral administration of caffeine and sodium benzoate solution

6-15. One reason epinephrine hydrochloride is frequently combined with lidocaine hydrochloride is that epinephrine aids in
1. decreasing the toxic effects of the anesthetic
2. accelerating the absorption rate of the anesthetic
3. increasing the potency of the anesthetic
4. prolonging the action of the anesthetic

6-16. The local anesthetic usually prescribed in the form of dusting powders for relief of pain in wounds, lozenges for throat irritations, and ointments for itching in various skin diseases is
1. hexylcaine hydrochloride
2. ethyl aminobenzoate
3. proparacaine hydrochloride
4. dibucaine hydrochloride

6-17. On what area of the body is proparacaine hydrochloride most widely used as a topical anesthetic?
1. Eyes
2. Ears
3. Nose
4. Throat

6-18. Neostigmine methylsulfate is prescribed primarily for the relief of
1. abdominal distention
2. allergic disorders
3. gastric acidity
4. motion sickness

6-19. What is the drug of choice for treating urinary retention?
1. Neostigmine bromide
2. Bethanechol chloride
3. Pilocarpine
4. Phenylephrine hydrochloride

6-20. Sympathomimetic drugs are also known as
1. anticholinergics
2. adrenergics
3. adrenergic blockers
4. cholinomimetics

6-21. Parasympatholytic (anticholinergic) drugs are used primarily to
1. stimulate peristalsis
2. dilate peripheral blood vessels
3. relax smooth muscles of the GI tract
4. initiate adrenal release of epinephrine

6-22. Which of the following drugs may be administered along with morphine to decrease the respiratory depressant effects of morphine?
1. Neostigmine bromide
2. Atropine
3. Phentolamine
4. Tolazoline hydrochloride

6-23. Propranolol hydrochloride is useful in treating cardiac arrhythmias because it produces an effect similar to that of
1. phentolamine
2. quinidine
3. propantheline bromide
4. ephedrine

6-24. Which of the following drugs is specifically contraindicated for asthmatic patients?
1. Propranolol HCl
2. Methyldopa
3. Epinephrine
4. Propantheline bromide

6-25. Methyldopa is used primarily for treating
1. bradycardia
2. essential hypertension
3. narcolepsy
4. urinary retention

6-26. To block the vasoconstrictive action of epinephrine, the physician may prescribe
1. tolazoline hydrochloride
2. neostigmine bromide
3. phenylephrine hydrochloride
4. propantheline bromide

6-27. Which of the following medications is specifically indicated for relieving migraine headaches?
1. Aspirin
2. Ergonovine
3. Ergotamine tartrate
4. Oxytocin

6-28. Which of the following is a characteristic side effect of antihistamines?
1. Drowsiness
2. Nausea
3. Tinnitus
4. Uriticaria

6-29. Which of the following antihistamines has local anesthetic properties?
1. Tripelennamine HCl
2. Diphenhydramine HCl
3. Dimenhydrinate
4. Chlorpheniramine maleate

6-30. Which of the following drugs would be prescribed to help alleviate postoperative and postanesthetic nausea and vomiting?
1. Meclizine
2. Tripelennamine HCl
3. Diphenhydramine
4. Dimenhydrinate

LEARNING OBJECTIVE: Upon completing items 6-31 thru 6-38, the learner will be able to identify (in writing) biologicals and their uses, potency, and methods of administration.

6-31. In what way are biological agents used to protect Navy personnel?
1. Sanitation
2. Immunization
3. Diagnosis
4. Resuscitation

6-32. Who is responsible for the licensing of manufacturers of biological agents?
1. Secretary of the Treasury
2. Secretary of Defense
3. Public Health Service
4. American Medical Association

6-33. What biologicals are used to immunize personnel against infections caused by *Clostridium tetani*, *C. perfringens*, and *C. septicum*?
1. Tetanus and gas gangrene antitoxin
2. Alum precipitated diphtheria and tetanus combined
3. Typhoid and paratyphoid vaccine
4. Diphtheria toxoid and pertussis vaccine combined

6-34. Which of the following vaccines should never be administered parenterally?
1. Yellow fever
2. Sabin poliovirus
3. Alum precipitated diphtheria and tetanus
4. Tetanus toxoid

6-35. What is the maximum number of days trivalent oral poliovirus vaccine may be used once the temperature of the vaccine rises above 0° C?
1. 6
2. 7
3. 8
4. 9

6-36. What is used to rehydrate yellow fever vaccine?
1. Triple distilled water
2. Sterile sodium chloride injection USP
3. Sterile distilled water and glycerine
4. Sterile water and glucose

6-37. What chemical agent is used to kill the rickettsiae developed in typhus vaccine?
1. Alcohol
2. Creosol
3. Formaldehyde
4. Acetone

6-38. For how many months will dried smallpox vaccine stored at 25° C retain full potency?
1. 12
2. 18
3. 24
4. 30

LEARNING OBJECTIVE: Upon completing item 6-39, the learner will be able to identify (in writing) the science that deals with poisons, their effect, and their antidotes.

6-39. The science that deals with poisons, their chemical and physiologic effects on ordinary healthy organisms, and the treatment of their toxic effects is called
1. toxicology
2. pharmacology
3. materia medica
4. preventive medicine

LEARNING OBJECTIVE: Upon completing items 6-40 thru 6-45, the learner will be able to identify (in writing) poisons and their classifications, symptoms, and treatments.

6-40. Morphine is what type of poison?
1. Alkaloidal
2. Nonalkaloidal
3. Inorganic
4. Gaseous

6-41. If your patient is exhibiting symptoms of nausea and vomiting, abdominal cramps, inflammation of the urinary tract, and bloody stools, you should suspect poisoning by a/an
1. excitant
2. depressant
3. irritant
4. corrosive

6-42. Food infection differs from food intoxication in that the former is usually caused by microorganisms of the genus
1. Salmonella
2. Proteus
3. Staphylococcus
4. Streptococcus

6-43. To determine whether an instrument or emetic is safe to use in treating poisoning when the identity of the poison is unknown, you should
1. examine the mucous lining of the mouth
2. note the condition of the victim's pupils
3. note the temperature of the victim
4. examine vomited matter, feces, and urine

6-44. An emetic is given to a patient to
1. empty the bowel
2. induce sleep
3. produce vomiting
4. clear the nasal passages

6-45. What is the usual dose of ipecac syrup in milliliters?
1. 5-10
2. 5-15
3. 10-20
4. 15-30

LEARNING OBJECTIVE: Upon completing items 6-46 thru 6-48, the learner will be able to identify (in writing) factors concerning controlled drugs.

6-46. Controlled drugs are those categorized by the
1. Drug Enforcement Administration
2. Comprehensive Drug Abuse Prevention and Control Act of 1970
3. Federal Drug Administration
4. Harrison Narcotics Act

6-47. Navy pharmacies may store, use, or dispense any of the following liquids EXCEPT
1. ethyl alcohol
2. methyl alcohol
3. nitric acid
4. sulfuric acid

6-48. Meperidine is a schedule _______ drug.
1. I
2. II
3. III
4. IV

LEARNING OBJECTIVE: Upon completing items 6-49 thru 6-51, the learner will be able to identify (in writing) facts related to antidote lockers.

6-49. An antidote locker will be located prominently in every
1. emergency treatment room
2. pharmacy
3. ward
4. operating room

6-50. In a small ship having only one hospital corpsman aboard, the antidote locker should be placed immediately outside the entrance to the
1. captain's cabin
2. emergency treatment room
3. mess deck
4. wardroom

6-51. Which of the following reference books should be kept next to the antidote locker?
1. Clinical Toxicology of Commercial Products
2. Remington's Pharmaceutical Sciences
3. Physicians' Desk Reference
4. Handbook of Drug Interactions

LEARNING OBJECTIVE: Upon completing item 6-52, the learner will be able to identify (in writing) the publication that contains legally enforceable standards for drugs.

6-52. Which of the following publications contains legally enforceable standards of purity, quality, and strength for drugs generally accepted by the medical profession in the United States?
1. United States Dispensatory (USD)
2. Remington's Pharmaceutical Sciences
3. United States Pharmacopeia (USP)
4. Physicians' Desk Reference

LEARNING OBJECTIVE: Upon completing items 6-53 thru 6-57, the learner will be able to identify (in writing) systems of weights and measures, their units of measurement, and their uses.

6-53. What is the official system of weights and measures used in Navy pharmacies?
1. Troy
2. Avoirdupois
3. Metric
4. Apothecary

6-54. Select the correct abbreviations for the metric system's primary units of (A) weight, (B) volume, and (C) linear measurement.
1. (A) gr, (B) l, (C) m
2. (A) gr, (B) ml, (C) mm
3. (A) g, (B) l, (C) m
4. (A) g, (B) dl, (C) dm

6-55. Which of the following units is equal to one-tenth of a meter?
1. hectometer (hm)
2. dekameter (dam)
3. decimeter (dm)
4. centimeter (cm)

6-56. In the apothecary system, the smallest unit for measuring the volume of a substance is the
1. minim
2. liter
3. dram
4. ounce

6-57. The commercial system of weight used in the U.S. is the
1. metric
2. avoirdupois
3. troy
4. apothecary

LEARNING OBJECTIVE: Upon completing items 6-58 thru 6-60, the learner will be able to identify (in writing) procedures used in conversion of units of measure.

6-58. A physician prescribes a daily intake of 60 ml of an antacid for a patient. What direction is the pharmacist likely to print on the prescription label?
1. 1 teaspoonful 4 times a day
2. 2 teaspoonfuls 3 times a day
3. 3 tablespoonfuls 2 times a day
4. 1 tablespoonful 4 times a day

6-59. A prescription requires 32 minims of a substance stocked in milliliters. How many milliliters will it take to fill the prescription?
1. 0.94
2. 1.97
3. 15.77
4. 19.70

6-60. How many milligrams equal 40 grains?
1. 0.62
2. 2.4
3. 2,600
4. 4,200

LEARNING OBJECTIVE: Upon completing items 6-61 thru 6-72, the learner will be able to identify (in writing) the mathematical calculations used in pharmacy.

Information for items 6-61 and 6-62:

Assume that the following is the correct formula for compounding 1,000 ml of potassium arsenite solution.

Arsenic trioxide . . . . 12.8 g

Potassium bicarbonate . . . . . 9.8 g

Alcohol . . . . 40.0 ml

Distilled water, qs to make . 1,000.0 ml

6-61. You receive a prescription for 285 ml of the preceding formula. How many milliliters of alcohol should you use in compounding the prescription?
1. 9.6
2. 11.4
3. 13.6
4. 15.9

6-62. If you receive a prescription for 1,800 ml of the preceding formula, how many grams of arsenic trioxide will you use?
1. 7.80
2. 19.40
3. 23.04
4. 25.60

6-63. A patient is to receive a 3/4 grain dose of phenobarbital. If you dissolve two 1/2 grain tablets of phenobarbital in 30 minims of water, how many minims of the solution should the patient receive?
1. 15.0
2. 18.6
3. 22.5
4. 26.8

In items 6-64 thru 6-66, select the answer from column B to the problem in column A. Items from column B may be used only once.

	A. Problems	B. Answers
6-64.	24.00 - 0.16	1. 24.00
6-65.	7.50 x 3.20	2. 23.92
6-66.	43.056 — 1.80	3. 23.84
		4. 23.76

6-67. Convert the decimal 0.875 to a fraction and reduce to its lowest terms.
1. 1/8
2. 3/8
3. 5/8
4. 7/8

6-68. A physician writes a prescription that should contain 62% distilled water. How many grams of distilled water should you use to prepare 150 g of the prescription?
1. 62
2. 71
3. 84
4. 93

6-69. A sample drug contains 2% alkaloids. How many grams of the drug would contain 7 g of alkaloids?
1. 190
2. 270
3. 350
4. 430

6-70. You have 480 g of a mixture. What percentage of sulfur does the mixture contain if 96 g of the total weight is sulfur?
1. 8
2. 12
3. 20
4. 32

6-71. If 250 ml of 70% alcohol is diluted with water until the total volume measures 375 ml, what is the percentage of alcohol in the 375 ml mixture?
1. 33.4
2. 40.1
3. 46.7
4. 53.2

6-72. How many grams of sodium chloride are needed to prepare 5,000 ml (W/V) of a 1:2,000 solution?
1. 1.5
2. 2.5
3. 3.5
4. 4.5

LEARNING OBJECTIVE: Upon completing item 6-73, the learner will be able to identify (in writing) the weight of 1 ml of distilled water.

6-73. What is the weight of 1 ml of distilled water?
1. 1 mg
2. 1 dg
3. 1 g
4. 1 cg

LEARNING OBJECTIVE: Upon completing item 6-74, the learner will be able to identify (in writing) the specific gravity of a liquid, given the volume and weight.

6-74. What is the specific gravity of 180 ml of a liquid weighing 183.6 g?
1. 0.96
2. 1.02
3. 1.34
4. 1.46

LEARNING OBJECTIVE: Upon completing item 6-75, the learner will be able to identify (in writing) the term applied to the process of grinding a solid substance into a powder using a mortar and pestle.

6-75. The process of reducing a solid substance to a powder by placing the solid in a mortar and grinding it with a pestle is known as
1. precipitation
2. levigation
3. trituration
4. maceration

Assignment 7

Pharmacy (continued); Health Records and Physical Examinations; Administration; Preventive Medicine

Textbook Assignment: Pages 8-14 through 11-5

LEARNING OBJECTIVE: Upon completing item 7-1, the learner will be able to identify (in writing) the separation process used to remove minute foreign particles from clear solutions.

7-1. What separation process should be used to remove minute foreign particles from clear solutions?
1. Centrifugation
2. Decantation
3. Filtration
4. Precipitation

LEARNING OBJECTIVE: Upon completing items 7-2 and 7-3, the learner will be able to identify (in writing) procedures for converting Fahrenheit degrees to Celsius and vice versa.

7-2. What Fahrenheit temperature is equivalent to 9° Celsius?
1. 23.2°
2. 41.0°
3. 48.2°
4. 51.6°

7-3. Convert 98.6° Fahrenheit to Celsius.
1. 23°
2. 30°
3. 37°
4. 44°

LEARNING OBJECTIVE: Upon completing item 7-4, the learner will be able to identify (in writing) the term applied to the process used for separating and purifying liquid solutions.

7-4. The process used for separating and purifying liquid solutions is called
1. distillation
2. maceration
3. percolation
4. sublimation

LEARNING OBJECTIVE: Upon completing item 7-5, the learner will be able to identify (in writing) the term applied to the process in which the soluble portions of a drug are softened and dissolved by soaking the drug in a menstruum.

7-5. The process in which the soluble portions of a drug are softened and dissolved by soaking the drug in a menstruum is called
1. percolation
2. maceration
3. filtration
4. precipitation

LEARNING OBJECTIVE: Upon completing item 7-6, the learner will be able to identify (in writing) the best method of distributing heat uniformly when using an open flame to heat a preparation.

7-6. When an open flame is used in heating a preparation, the best method of distributing heat uniformly is to
1. use a wire gauze
2. use a low flame
3. keep the flame in constant motion beneath the container
4. use a metal plate

LEARNING OBJECTIVE: Upon completing items 7-7 and 7-8, the learner will be able to identify (in writing) the balance required in all pharmacies and the proper care of balances.

7-7. A class _______ balance is required in all pharmacies.
1. A
2. B
3. C
4. D

7-8. In caring for a pharmaceutical balance, all of the following procedures should be observed EXCEPT
1. protecting the pans with paper
2. placing the weights on the left pan
3. keeping the beams in an oscillating position
4. storing the balance in a closed case

LEARNING OBJECTIVE: Upon completing item 7-9, the learner will be able to identify (in writing) the term applied to aqueous solutions of volatile substances used as vehicles.

7-9. Aqueous solutions of volatile substances generally used as vehicles are known as
1. elixirs
2. mixtures
3. spirits
4. waters

LEARNING OBJECTIVE: Upon completing items 7-10 thru 7-14, the learner will be able to identify (in writing) pharmaceutical preparations and criteria for their preparation and issue.

7-10. The strength of potent drugs in tinctures is usually _______ %.
1. 5
2. 10
3. 15
4. 20

7-11. Alcoholic solutions of vegetable drugs of such strength that 1 ml of the solution contains the active ingredients of 1 g of the crude drug are called
1. spirits
2. fluid extracts
3. syrups
4. elixirs

7-12. Aromatic, sweetened, hydroalcoholic solutions containing medicinal substances are called
1. syrups
2. elixirs
3. spirits
4. tinctures

7-13. Many elixirs are prepared by adding the medicinal substances directly to
1. the alcohol before adding other ingredients
2. liquid glucose
3. aromatic elixir
4. a mixture of alcohol and syrup

7-14. Magmas should always be dispensed with
1. complete directions for preparation
2. "Poison" labels
3. "Shake Well" labels
4. special containers for administration

LEARNING OBJECTIVE: Upon completing item 7-15, the learner will be able to identify (in writing) the type of incompatibility, if any, that exists between oil and water.

7-15. What type of incompatibility, if any, exists between oil and water?
1. Chemical
2. Physical
3. Therapeutic
4. None

LEARNING OBJECTIVE: Upon completing item 7-16, the learner will be able to identify (in writing) the first thing a pharmacist should do upon receiving a prescription.

7-16. The first thing a pharmacist should do upon receiving a prescription is to
1. assemble the material for filling the prescription
2. prepare containers for receiving the finished product
3. study the prescription carefully
4. enter all data in the prescription book

LEARNING OBJECTIVE: Upon completing items 7-17 thru 7-46, the learner will be able to identify (in writing) facts concerning the health record and associated forms.

7-17. The health record of a member of the Armed Forces is a valuable aid in
1. determining claims
2. determining physical fitness
3. compiling medical statistics
4. all of the above

7-18. The circumstances under which a health record may be opened, closed, and maintained are described in detail in MANMED, chapter
1. 15
2. 16
3. 23
4. 25

7-19. In which of the following instances should health records be verified?
1. Upon reporting
2. Upon transfer
3. At the time of physical examination
4. All of the above

7-20. Release of health care information to the individual concerned falls within the purview of the Freedom of Information Act.
1. True
2. False

7-21. When the initial health record is opened, it contains the following forms on the right side. Select the correct top-to-bottom sequence.
1. SF 88, SF 93, SF 600, SF 601, NAVMED 6150/4
2. NAVMED 6150/4, SF 88, SF 93, SF 600, SF 601
3. SF 600, SF 601, NAVMED 6150/4, SF 88, SF 93
4. SF 600, SF 601, SF 88, SF 93, NAVMED 6150/4

7-22. What disposition is made of the health record of a naval reservist assigned to a drill unit of the Selected Reserve?
1. It is sent to the Commander, Naval Military Personnel Command.
2. It is forwarded to the Commanding Officer, Naval Reserve Personnel Center.
3. It is sent to the naval district commandant.
4. It is forwarded to the drill unit to which the reservist is assigned.

7-23. Instructions for opening health records for civilians selected for an officer candidate program may be found in all of the following publications EXCEPT
1. MANMED
2. The U.S. Navy Recruiting Manual
3. NAVREGS
4. Naval Reserve Recruiting Instructions

7-24. A health record in NOT closed when a member
1. retires
2. is transferred to a new duty station
3. is declared a deserter
4. is transferred to the Fleet Reserve

7-25. The health record of a member who is officially declared a deserter will be retained on board the parent unit (except deployed submarines) for a period of _______ days.
1. 5
2. 30
3. 90
4. 180

7-26. When a patient in a naval hospital is separated from the naval service but subsequently retained in the hospital for further treatment, the health record will be closed and the medical history continued on
1. SF 502
2. SF 513
3. SF 600
4. DD 689

7-27. Health records are for official use only but are subject to inspection at any time by
1. the commanding officer or his or her seniors in the chain of command
2. the fleet medical officer
3. duly authorized medical inspectors
4. all of the above

7-28. When a health record or any portion thereof approaches a state of illegibility or deterioration that may endanger its future use or value as a permanent record, it will be duplicated and designated
1. DUPLICATE
2. REPLACEMENT
3. COPY
4. CERTIFIED COPY

7-29. The form used to readily identify members of the Navy and Marine Corps assigned to the Personnel Reliability Program is
1. NAVMED P-5090
2. NAVMED 6150/2
3. NAVMED 6600/3
4. NAVPERS 5510/1

For items 7-30 through 7-33, select from column B the health record form for recording the information listed in column A. An item in column B may be used more than once.

	A. Information	B. Forms
7-30.	Dental examination not performed by a dental officer	1. SF 88
7-31.	All minor defects noted	2. SF 93
7-32.	A member's personal medical history prior to entry into the Navy	3. SF 600
7-33.	A sick call visit	4. SF 601

For items 7-34 thru 7-37, select from column B the health record form identified by the statements in column A. An item in column B may be used only once.

	A. Statements	B. Forms
7-34.	It provides a record of physical qualifications, special training, and periodic examinations of members designated for the performance of special duty such as aviation, submarine, and diving.	1. SF 601
7-35.	It is a valuable means of identification.	2. SF 602
7-36.	It pertains to prophylactic immunizations and sensitivity reactions.	3. SF 603
7-37.	Any discussion with patients of its content is privileged information.	4. NAVMED 6150/2

7-38. The manufacturer's name and the batch or lot number must be recorded on SF 601 for _______ vaccines.
1. yellow fever, cholera, and smallpox
2. smallpox, cholera, and tetanus
3. smallpox, yellow fever, and plague
4. yellow fever, plague, and cholera

7-39. Notations concerning valvular or congenital heart disease and hypersensitivities are entered on SF 603 and DD 722-1 by what method?
1. Typed in black uppercase letters
2. Typed in red uppercase letters
3. Written in red pencil
4. Written in black or blue-black ink

7-40. The form that provides a chronological history of ships and stations to which a member has been assigned for duty and treatment and an abstract of medical history for each admission to the sick list is NAVMED
1. 6150/1
2. 6150/2
3. 6150/3
4. 6150/4

7-41. When should NAVMED 6150/2 be prepared for a person joining the Navy?
1. Within 30 days of original enlistment
2. At the time of the first special duty examination
3. When the health record is opened
4. When the member reports to the first permanent duty station

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For items 7-42 thru 7-45, select from column B the naval health record form that corresponds to the statement listed in column A. An item in column B may be used more than once.

	A. Statements	B. Forms
7-42.	It is started when military personnel are first exposed to ionizing radiation	1. DD 1141
		2. DD 689
7-43.	It is normally used to record clinical data on inpatient care and treatment.	3. SF 502
7-44.	It is devised for cross-service medical notification.	
7-45.	It will not be necessary if direct cross-servicing of the health record is possible.	

7-46. What is the correct disposition of DD 689?
1. Insert it in the health record.
2. Forward it to BUMED upon completion of treatment.
3. After the information on it has been transcribed, return it to the medical facility that provided the treatment.
4. Destroy it after the information on it has been transcribed to SF 600.

LEARNING OBJECTIVE: Upon completing items 7-47 thru 7-53, the learner will be able to identify (in writing) information associated with physical examinations.

7-47. Reenlistment pertains to an enlistment in the Navy or Marine Corps of someone with prior service in any branch of the Armed Forces.
1. True
2. False

7-48. A complete physical examination conducted and reported to BUMED during the preceding 12 months will obviate the need for the annual physical examination of all EXCEPT _______ officers.
1. aviation
2. submarine
3. flag and general
4. diving

7-49. Naval flight officers are assigned to what class or service group?
1. Class 1, service group I
2. Class 1, service group II
3. Class 1, service group III
4. Class 2

7-50. A former enlisted member who at the time of discharge was not recommended for reenlistment because of physical disability may reenlist if authorized by
1. NMPC
2. BUMED
3. the Navy Department
4. the member's former commanding officer

7-51. A waiver of the physical standards for a disqualifying defect is required if
1. the examiner considers the defect to be of little future significance
2. the defect may jeopardize the health of the member's associates
3. the defect is considered disqualifying but is not likely to interfere with the performance of military duties
4. the defect might jeopardize the member's health in the performance of his or her duties

7-52. No change in the member's status will be made pending final action on the recommendation for waiver of the physical standards by the
1. Commander, NMPC, or the Commandant of the Marine Corps
2. Navy Department
3. commanding officer
4. Chief, BUMED

7-53. Provided there has been no significant change in the member's physical or mental condition, a medical examination for separation from active duty of a member desiring to reenlist is valid for a period of
1. 30 days
2. 60 days
3. 90 days
4. 6 months

LEARNING OBJECTIVE: Upon completing item 7-54, the learner will be able to identify (in writing) the officer responsible for the overall administration of the command weight control program.

7-54. Responsibility for the overall administration and enforcement of the command weight control program is assigned to the
1. director of administrative services
2. executive officer
3. commanding officer
4. medical officer

LEARNING OBJECTIVE: Upon completing items 7-55 thru 7-59, the learner will be able to identify (in writing) some of the reports and logs used by the Medical Department and their uses.

7-55. The form that lists all the members recommended to be excused from duty because of illness is
1. NAVMED-M
2. NAVMED-U
3. NAVMED-S
4. NAVMED-T

7-56. NAVMED-T, Morning Report of Sick, must be submitted to the commanding officer by what hour each day?
1. 0830
2. 0900
3. 0930
4. 1000

7-57. Which of the following should be entered in the Medical Journal?
1. Results of inspections of fresh provisions
2. List of personnel entered on or deleted from the binnacle or sick list
3. Reports of personnel casualties, injuries, and deaths
4. All of the above

7-58. Documentary support and aid in the compilation of the monthly Medical Services and Outpatient Morbidity Report and the annual Report of Tuberculin Retesting is provided by
1. the Statistical Data Log
2. the Sick Call Treatment Log
3. NAVMED-S
4. NAVMED-T

7-59. Readings of daily residual chlorine levels and results of weekly bacteriological examinations of potable water are entered in the
1. Medical Journal
2. Statistical Data Log
3. Water Test Log
4. Potable Water Record

LEARNING OBJECTIVE: Upon completing item 7-60, the learner will be able to identify (in writing) a similarity between instructions and notices.

7-60. One way in which instructions and notices issued in the Navy Directives System are similar is that both
1. contain information of a continuing nature
2. contain information of a temporary nature
3. have the same force and effect
4. provide for their own cancellation

LEARNING OBJECTIVE: Upon completing items 7-61 thru 7-64, the learner will be able to identify (in writing) facts pertaining to OCR documents and equipment.

7-61. The OCR scanner will reject any document that has
1. erasures
2. strikeovers
3. misalignments
4. any of the above

7-62. The degree of darkness of typed characters on an OCR document is called
1. optical opacity
2. density
3. shade
4. sharpness

7-63. The scanner will reject any character typed in a dropout blue area, except a delete symbol.
1. True
2. False

7-64. Fabric ribbons must be used for OCR typing since carbon ribbons do not provide adequate and consistent density.
1. True
2. False

LEARNING OBJECTIVE: Upon completing item 7-65, the learner will be able to identify (in writing) the procedure to be carried out by personnel following extended exposure to a wet environment.

7-65. The marine unit you are assigned to has been maneuvering through a swamp all morning. At 1100 you break out into rolling farmland. As the unit corpsman, you should suggest
1. a rest break until 1200 to relieve fatigue
2. that this would be a good time for lunch
3. that feet should be dried and both socks and boots be changed
4. a standard 10-minute program of limbering-up exercises to prepare the troops for the next phase of the maneuver

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LEARNING OBJECTIVE: Upon completing items 7-66 thru 7-73, the learner will be able to identify (in writing) facts and procedures concerning vaccines and immunizations.

7-66. If annual flu shots are mandatory for all active duty military personnel, they would be considered a _______ immunization.
1. primary
2. secondary
3. discretionary
4. prophylactic

7-67. You go into the sickbay freezer to obtain a bottle of yellow fever vaccine and notice that the bottle contents are in a liquid state. You should do all of the following EXCEPT
1. empty the contents down the sink and throw the bottle out
2. have the refrigerator compressor and thermostat checked
3. request disposition instructions from the supplier
4. discontinue using all yellow fever vaccine in that shipment

7-68. Before immunizing a group of servicemen against influenza, obtain each person's medical record and check the _______ for hypersensitivity reactions to the vaccine.
1. SF 600 (Special) and SF 601
2. SF 602 and SF 603
3. NAVPERS 5510/1
4. DD 722 and DD 722-1

7-69. The typhoid basic series consists of two injections of 0.5 ml SC or IM given 4 weeks apart. Some crewmembers receive their first injection and are deployed for 3 months. Upon returning from deployment, you should
1. start the basic series over
2. give the second injection
3. request instructions from a physician
4. give a single booster dose before the crewmembers are sent to a typhoid-endemic area

7-70. When administering a smallpox vaccination, the improper use of alcohol to clean the skin will cause
1. bleeding
2. inactivation of the virus
3. infection
4. intensified reaction to the virus

7-71. Six to eight days after a smallpox vaccination, the presence of _______ at the vaccination site indicates a successful reaction.
1. unblemished skin
2. a typical vesicle
3. an indurated lesion at least 5 mm in diameter
4. the typical tatoolike blemish

7-72. Which of the following vaccines is given in accordance with the Surgeon General's directive?
1. Typhoid
2. Oral poliovirus
3. Influenza
4. Yellow fever

7-73. All immunizations can be authenticated by initials EXCEPT
1. tetanus, yellow fever, and plague
2. oral poliovirus, influenza, and cholera
3. smallpox, influenza, and cholera
4. cholera, smallpox, and yellow fever

LEARNING OBJECTIVE: Upon completing items 7-74 thru 8-36, the learner will be able to identify (in writing) data concerning diseases, including symptoms, incidence rates, prevention, transmission, and treatment.

7-74. A person who eats lunch with a person who has typhoid is called
1. a carrier
2. a contact
3. contaminated
4. a host

7-75. A physical or chemical means of destroying undesirable animal and insect pests in a particular area is called
1. disinfection
2. disinfestation
3. fumigation
4. decontamination

Assignment 8

Preventive Medicine (continued); Chemical, Biological, and Radiological Warfare

Textbook Assignment: Pages 11-5 through 12-9

8-1. A disease that has historically been present at a constant incidence rate in a particular area is called
1. endemic
2. epidemic
3. epizootic
4. infectious

8-2. Individuals who harbor an infectious agent and who have either a manifest disease or an inapparent infection are known as
1. carriers
2. hosts
3. infected persons
4. suspects

8-3. The capability of an infectious agent to cause disease in a susceptible host is known as
1. susceptibility
2. infection
3. pathogenicity
4. transmission

8-4. The transmission of an infectious agent to a person through the bite of an arthropod is called _______ transmission.
1. direct
2. vehicleborne
3. vectorborne
4. airborne

8-5. A characteristic symptom of bubonic plague is the development of
1. swollen lymph nodes
2. ulcerating skin lesions
3. pulmonary pneumonia
4. septicemia

8-6. When your unit is deployed to an area where bubonic plague is epidemic, you can help prevent the disease by ensuring that everyone has been immunized and by
1. segregating personnel from the native population
2. killing rats and fleas
3. promoting personal hygiene
4. preparing weekly preventive medicine survey reports

8-7. Relapsing fever is spread to people in crowded, unsanitary conditions by infective lice and
1. flies
2. fleas
3. ticks
4. spirochetes

8-8. To prevent the spread of relapsing fever, you should promote personal hygiene and habitation cleanliness and regularly
1. distribute vitamin supplements
2. kill rats and fleas
3. disinfect personnel
4. delouse personnel

8-9. Like louseborne relapsing fever, louseborne typhus is transmitted by crushing a Pediculus humanus into a bite wound or an abrasion. In addition, the typhus rickettsia may be infectious when
1. infolded
2. ingested
3. inhaled
4. injected

8-10. Delousing is normally done with 1% _______ powder.
1. DDT
2. lindane
3. malathion
4. baygon

8-11. Although the chances are slim that you will run into a case of smallpox, the possibility that the disease may reoccur is very real. Be sure all personnel in your unit have been vaccinated and
1. be suspicious of cases of chickenpox until diagnosis is confirmed
2. carefully check all crewmembers returning from liberty in foreign ports
3. quarantine all patients with suspicious skin rashes
4. wait for PMU notification of any smallpox outbreaks

8-12. There is a chance that a sailor on your ship might contract yellow fever during a port-of-call liberty in which of the following countries?
1. Japan
2. Morocco
3. Canada
4. Brazil

8-13. If your ship makes a port-of-call in a country with a very low standard of living, you should advise the crewmembers to avoid _______ while on liberty as a way of preventing an amebiasis outbreak aboard.
1. drinking pasteurized milk
2. frequenting bars
3. touching or petting local animals
4. eating salad dishes

8-14. Sickbay is suddenly inundated with dozens of sailors with essentially identical complaints including dizziness, blurred vision, dryness of the mouth, and weakness. You should suspect an outbreak of
1. amebiasis
2. botulism
3. chickenpox
4. flu

8-15. Your unit is deployed in a tropical area where dengue fever is endemic. It will bivouac in one particular area for at least 1 month. As the unit corpsman, you should recommend
1. daily showers for all personnel
2. increased nutritional intake
3. a mosquito-control program
4. immediate immunization for all personnel

8-16. Less than a week after liberty in an Asian port, a crewmember comes down with fever, nausea, vomiting, cramps, and bloody stools. Laboratory analysis of the stools confirms the presence of Shigella bacilli. Your first treatment priority is to
1. MEDEVAC the patient
2. contact a doctor for direction
3. give an IV infusion of electrolyte fluids
4. give aspirin and Kaopectate immediately

8-17. One of the corpsmen on your ward has contracted serum hepatitis. This indicates that the corpsman
1. is probably a drug addict
2. has passed the virus to everyone on the ward
3. has unsanitary habits that must be corrected
4. may have been contaminated through careless patient care techniques

8-18. A key symptom of most types of malaria is
1. a persistant fever of 105° F or higher
2. hypothermia
3. cyclic febrile and afebrile periods
4. intensely painful mosquito bites

8-19. Your unit is sent to a malaria-endemic area. You are responsible for ensuring all of the following EXCEPT that
1. choroquine-primaquine therapy begins 1 day before arrival
2. primaquine is given daily for 2 weeks after the unit leaves the area
3. personnel use insect repellents and nets
4. health record entries are kept complete and up-to-date

8-20. Measles are normally a childhood disease but may appear in a military population. The key symptom is the rash that starts
1. on the trunk and then becomes localized in the abdominal area
2. in the perianal area and spreads upward
3. on the feet and spreads upward
4. on the face and quickly becomes generalized

8-21. Rubella has broken out in your unit. The victims must be isolated from all
1. other personnel
2. unvaccinated personnel
3. women of childbearing age
4. unvaccinated women of childbearing age

8-22. Meningococcal meningitis often breaks out on military bases because of
1. crowded communal living
2. frequently deployed personnel
3. the presence of foreign-born dependents
4. the diversity of susceptibility

8-23. The symptom that most clearly indicates the presence of mumps is
1. chills
2. anorexia
3. malaise
4. enlarged salivary glands

8-24. Cases of viral pneumonia have appeared on your ship. You do all of the following to control the spread of the disease EXCEPT
1. reminding all hands of the basic rules of hygiene and sanitation
2. keeping the crew warm, rested, and dry whenever possible
3. immunizing all hands
4. encouraging the crew to eat balanced meals

8-25. Natural resistance to pneumococcal pneumonia is reduced by all of the following EXCEPT
1. chronic alcoholism
2. overworking
3. previous viral URI
4. overeating

8-26. In temperate areas of the world, respiratory disease is usually least prevalent during
1. spring
2. summer
3. fall
4. winter

8-27. Whenever a person is bitten by a warm-blooded animal, you must consider the possibility of rabies infection. Treatment of the bite usually includes all of the following EXCEPT
1. thorough cleansing with soap and water
2. thorough rinsing with water
3. giving a tetanus booster
4. suturing the wound

8-28. Athlete's foot is preventable. As a unit corpsman, you should ensure that the laundry is operated according to current specifications, personnel are indoctri-nated to proper hygiene practices, and
1. shower areas are kept clean and disinfected
2. all decks are swabbed daily with a fungicidal agent
3. proper nutritional levels are maintained at each meal
4. dressing room areas are frequently inspected for mold and mildew

8-29. A significant proportion of all hospital corpsmen are asymptomatic nasal carriers of staphylococci. Personnel so identified must be
1. exempted from all ward duties
2. very careful about droplet spread and personal hygiene
3. assigned to administrative duties instead of patient care areas
4. hospitalized until the infection subsides

8-30. It is standard practice to _______ after a puncture injury.
1. quickly close the wound
2. give a tetanus booster
3. force O_2 into the wound to kill anaerobic bacteria
4. give muscle relaxants

8-31. Persons with PPD reactions of 10 mm or more induration
1. have tuberculosis
2. will develop tuberculosis within a year
3. must be isolated from the general population
4. must have regular X-ray examinations because of their increased risk

8-32. Typhoid fever is transmitted primarily by
1. biting insects
2. people with open cuts or sores
3. improper food handling techniques
4. eating shellfish out of season

8-33. Which of the following statements about gonorrhea is true?
1. Carriers are easy to identify.
2. Treatment is usually 1 g of oral probenecid followed by 2.4 million units of aqueous procaine penicillin G IM.
3. Showing an STD film to crewmembers before liberty is sufficient preventive medicine.
4. All patients must be referred to a trained STD interviewer if the chain of infection is to be broken.

8-34. If a male patient has the signs and symptoms of gonorrhea, but the laboratory cannot find N. gonorrhea, you should suspect
1. nongonococcal urethritis
2. syphilis
3. herpes genitalis
4. venereal warts

8-35. When treating personnel for skin disorders, it is important to remember that you may be seeing signs and symptoms of
1. primary syphilis
2. secondary syphilis
3. tertiary syphilis
4. herpes genitalis

8-36. A common STD is herpes genitalis. The treatment for this condition is
1. 4.8 million units of aqueous procaine penicillin G IM
2. 2.4 million units of aqueous procaine penicillin G IM
3. tetracycline given under a physician's supervision
4. generally supportive until the infection disappears

LEARNING OBJECTIVE: Upon completing items 8-37 and 8-38, the learner will be able to identify (in writing) factors concerning food service sanitation.

8-37. All food service personnel must receive a physical examination before initially reporting for duty in food service and
1. every 30 days thereafter
2. upon termination of their assignment
3. after any absence due to illness
4. after each PPD test

8-38. When you are on a sanitation inspection of a food service area, you are required to
1. question each employee about his or her hygiene practices
2. check the size of hand washing signs
3. ensure that employees have received the required training
4. personally observe each employee's hands, hair, and face for cleanliness

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LEARNING OBJECTIVE: Upon completing items 8-39 thru 8-53, the learner will be able to identify (in writing) considerations of insect and rodent control.

8-39. If your ship has a serious pest-control problem that doesn't seem to improve, you should do all of the following EXCEPT
1. experiment with every available insecticide
2. request advice from the district or area entomologist
3. ensure that a corpsman on the vessel receives shipboard pest control training and certification
4. research current BUMED preventive medicine publications for new information on pest control

8-40. To minimize the hazards of pesticide use, you should do all of the following EXCEPT
1. check the instruction labels of every pesticide you use
2. protect all foodstuffs from contamination
3. don recommended protective clothing before spraying
4. wear an OSHA-approved respiratory device with any cartridge available

8-41. When pesticides are stored aboard ship, the Medical Department is responsible for maintaining _______ the chemicals.
1. security for
2. supply control of
3. antidotes for
4. possession of

8-42. As a unit corpsman, the most important thing you can do to control problems with flies is
1. insisting on proper sanitation practices
2. ensuring that all buildings are well screened
3. larviciding latrines with PDB
4. applying residual insecticides to areas covered with flies

8-43. An example of a temporary mosquito-control measure is
1. draining standing water near base camp areas
2. leveling low spots in the base camp area
3. using larvicidal insecticides around the base camp
4. using space sprays to kill mosquitos in tents and buildings

8-44. In a field situation where shower and laundry facilities are unavailable, lice are best controlled by
1. changing clothes frequently
2. using large amounts of insecticidal powder
3. individually detecting and removing nits
4. using residual insecticidal sprays

8-45. A command bedbug problem is recognized by the presence of hard, white wheals on patients' bodies and
1. pests on the deck
2. regional preventive medicine reports
3. blood stains on mattresses
4. all of the above

8-46. Cockroaches in food preparation areas can be successfully eliminated by
1. keeping the area well lighted at all times
2. spraying daily
3. keeping the area and equipment clean
4. emptying garbage cans hourly

8-47. To minimize problems caused by chiggers, a bivouac area can be prepared in advance by
1. leveling the area to the bare ground
2. draining standing water
3. filling in low spots
4. spraying with aerosol insecticides

8-48. If you discover a tick feeding on your body, you should
1. pull it off with tweezers
2. burn it with the lighted tip of a cigarette
3. cover it with antiseptic to reduce the chance of infection
4. cover it with vaseline and let it drop off by itself

8-49. You are tasked with rodent control in a plague-endemic area. Before starting rat extermination, dust rat burrows with insecticides to
1. disorient the rats
2. flush the rats from the burrows
3. destroy the flea population before it can be spread
4. poison both the fleas and the rats

8-50. You are preparing poison bait to help control an infestation of roof rats. The anticoagulant rodenticide should be mixed with _______ for best results.
1. meat and fish
2. fruits and vegetables
3. milk and cheese
4. bread

8-51. When anticoagulants are mixed with foods, the baits
1. must be changed frequently
2. must be changed every 2 weeks
3. must be changed monthly
4. can be kept indefinitely

8-52. Preferred baits for spring traps include all of the following EXCEPT
1. bread soaked in bacon grease
2. peanut butter
3. coconut
4. cheese

8-53. Which of the following is a sure sign of the presence of rodents aboard ship?
1. Gnawing marks on food boxes
2. Black, greasy traces near bulkheads
3. Recent flea infestation
4. Each of the above

LEARNING OBJECTIVE: Upon completing items 8-54 thru 8-57, the learner will be able to identify (in writing) factors related to maintaining a potable water supply.

8-54. When a naval command obtains water from a stateside municipality, the Navy is responsible for
1. ensuring that the delivered water is pure
2. ensuring that the municipality has chlorinated the water
3. the integrity of the base water distribution system
4. the disinfection of all water received

8-55. When iodine tablets or calcium hypochlorite ampules are used to disinfect the water in your canteen,
1. boil the water for 15-20 minutes
2. chemically check the water before drinking
3. wet the canteen threads with the solution
4. rinse out the canteen daily

8-56. The acceptable FAC level for shipboard water normally is _______ ppm.
1. 0.02
2. 0.2
3. 2.0
4. 20.0

8-57. When doing bacteriological testing on your ship's water supply, a few red-colored colonies of bacteria appear after the 24-hour incubation period. You should
1. suspect fecal contamination and start immediate correction procedures
2. incubate the sample for 24 more hours to see if additional colonies develop
3. consider increasing the FAC level in the water
4. take no action since the colonies are benign

LEARNING OBJECTIVE: Upon completing items 8-58 thru 8-70, the learner will be able to identify (in writing) facts pertaining to chemical warfare.

For items 8-58 thru 8-61, select from column B the chemical agent that produces the effects in column A. Items from column B may be used only once.

	A. Effects		B. Agents
8-58.	Blistering of the skin	1.	Blood agents
8-59.	Interference with oxygen transfer	2.	Lacrimators
8-60.	Pulmonary edema	3.	Choking agents
8-61.	Temporary irritation of the eyes	4.	Vesicants

8-62. The tendency of a chemical agent to remain in a contaminated area is known as
1. volatility
2. vulnerability
3. persistency
4. permeability

8-63. Early symptoms of exposure to nerve gases include
1. ulceration of the skin
2. excessive dryness of the mouth
3. complete failure of body functions and paralysis
4. constriction of pupils, respiration difficulties, convulsions, massive salivation, and drowsiness

8-64. Medical personnel should administer atropine to a nerve agent casualty until the victim
1. has received three injections
2. is free from the nerve agent
3. develops tachycardia and dry mouth
4. regains spontaneous respiration

8-65. Treatment of a casualty suffering from exposure to HD must be symptomatic because
1. the symptoms are delayed
2. there is no known specific treatment
3. the victim immediately goes into deep shock
4. death usually occurs within 2 to 12 hours

8-66. The part of the body most vulnerable to mustard gas is the
1. skin
2. eyes
3. lungs
4. heart

8-67. In treating casualties of a blood gas attack, you should first administer amyl nitrite followed by
1. sodium thiosulfate orally
2. potassium thiosulfate orally
3. sodium thiosulfate IV
4. potassium thiosulfate IV

8-68. Symptoms of phosgene exposure usually appear after
1. 15 to 30 minutes
2. 30 to 60 minutes
3. 1 to 3 hours
4. 2 to 6 hours

8-69. First aid for CN exposure consists of
1. exposure to fresh air and letting wind blow into the wide open eyes
2. atropine injections
3. BAL ointment applications
4. keeping the eyes closed to decrease pain

8-70. Which of the following actions should be taken by a victim of adamsite contamination?
1. Putting on the mask and lying down until all symptoms have passed
2. Blotting the contaminant and flushing with water
3. Donning the mask and carrying on duties, exercising as vigorously as possible to clear the system of the gas
4. Rubbing in M-5 ointment for 30 seconds and wiping it off with a clean cloth

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LEARNING OBJECTIVE: Upon completing items 8-71 thru 8-75, the learner will be able to identify (in writing) facts pertaining to radiological exposure.

8-71. In the absence of specially constructed shelters, which of the following places affords the best protection during a nuclear explosion ashore?
1. The middle floor of a three-story, steel-framed building, near a supporting column
2. The lowest floor of a wooden building, in the doorway of an interior room
3. The basement of a reinforced concrete building, near a wall
4. The lowest floor of a brick-veneer building, near an exterior wall

8-72. During a nuclear attack, what body position will provide the most protection?
1. Sitting, with the knees drawn up to the chest
2. Supine, with the face covered
3. Lateral recumbent, with the face away from the light
4. Prone, with the face covered

8-73. During a nuclear explosion, which of the following types of clothing probably affords the best protection against burn injuries?
1. Tight-fitting, dark-colored cotton
2. Tight-fitting, light-colored nylon
3. Loose-fitting, dark-colored cotton
4. Loose-fitting, light-colored wool

8-74. Alpha particles, which are a serious internal radiation hazard, may enter the body through
1. open wounds
2. the mouth
3. the nasal passages
4. any of the above routes

8-75. Which of the following types of radiation has the greatest penetrating power?
1. Alpha
2. Beta
3. Gamma
4. Neutron

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PRINT OR TYPE

HOSPITAL CORPSMAN 3 & 2
NAVEDTRA 10669-B

NAME ______________________ Last First Middle

ADDRESS ______________________ Street/Ship/Unit/Division, etc.

______________________ City or FPO State Zip

RANK/RATE ________ SOC. SEC. NO. ______________ DESIGNATOR ________ ASSIGNMENT NO. ________

☐ USN ☐ USNR ☐ ACTIVE ☐ INACTIVE OTHER (Specify) ______________ DATE MAILED ________

SCORE ☐

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PRINT OR TYPE

HOSPITAL CORPSMAN 3 & 2
NAVEDTRA 10669-B

NAME ______________________________ ADDRESS ______________________________
Last First Middle Street/Ship/Unit/Division, etc.
____
City or FPO State Zip

RANK/RATE ________ SOC. SEC. NO. ______________________ DESIGNATOR ________ ASSIGNMENT NO. ________

☐ USN ☐ USNR ☐ ACTIVE ☐ INACTIVE OTHER (Specify) ________________ DATE MAILED ________

SCORE ☐

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3	☐	☐	☐	☐	_____	28	☐	☐	☐	☐	_____	53	☐	☐	☐	☐	_____
4	☐	☐	☐	☐	_____	29	☐	☐	☐	☐	_____	54	☐	☐	☐	☐	_____
5	☐	☐	☐	☐	_____	30	☐	☐	☐	☐	_____	55	☐	☐	☐	☐	_____
6	☐	☐	☐	☐	_____	31	☐	☐	☐	☐	_____	56	☐	☐	☐	☐	_____
7	☐	☐	☐	☐	_____	32	☐	☐	☐	☐	_____	57	☐	☐	☐	☐	_____
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17	☐	☐	☐	☐	_____	42	☐	☐	☐	☐	_____	67	☐	☐	☐	☐	_____
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19	☐	☐	☐	☐	_____	44	☐	☐	☐	☐	_____	69	☐	☐	☐	☐	_____
20	☐	☐	☐	☐	_____	45	☐	☐	☐	☐	_____	70	☐	☐	☐	☐	_____
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